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HARRIS (W. V.). **Termites: their recognition and control.**—$8\frac{3}{4} \times 5\frac{1}{2}$ in., xii + 187 pp., 28 pls. (4 col.), 26 figs., 1 fldg. table, 5 pp. refs. London, Longmans, Green & Co. Ltd., 1961. Price £2.

Termites cause important damage to structural timbers, to wooden goods, paper, cloth and certain plastics, to trees and to some growing crops in the warmer parts of the world. This book was written to assist the diagnosis of termite damage and to review measures for its prevention and control and is the first survey of the subject in English as a world problem. The first two chapters are concerned with the biology of termites, including their feeding and social habits, and the third with their classification; this includes descriptions of the various families and subfamilies, with notes on the genera, keys to families, and a survey of termite distribution. Three chapters follow in which termites are considered in their relation to the soil and as pests of agriculture and forestry, with notes on the more important species, their distribution and control, and a list of termites recorded as agricultural pests. The last three chapters deal with damage to timber, buildings and miscellaneous materials. The first of these includes lists of termite-resistant commercial timbers and timbers of which the sapwood is difficult to impregnate with preservatives or the heartwood easy to impregnate, followed by notes on field and laboratory testing for termite resistance. The second includes information on the prevention and control of attack in buildings, with world lists of the species concerned, arranged systematically and regionally. Information on the more important chemicals used in the prevention and control of attack is given in an appendix.

SINGH (Sardar), SIDHU (A. S.) & SIDHU (H. S.). **Field control of cotton Jassid and whitefly in the Punjab.**—*Indian Cott. Gr. Rev.* **12** no. 6 pp. 391–405, 2 graphs, 13 refs. Bombay, 1958.

Empoasca devastans Dist. and *Bemisia tabaci* (Gennadius) are important pests of cotton in the Punjab area of India. Their bionomics are summarised, the literature on their control is reviewed and experiments at two places in which sprays of various insecticides were applied against them are described. Effective control of both species was given by a suspension spray containing 0·1 per cent. each of DDT and BHC or an emulsion spray of 0·02 per cent. endrin applied fortnightly at 50–100 gal. per acre. Several phosphorus insecticides gave high initial kill but rapidly lost their effect.

MURTHY (D. V.). **A preliminary note on the control of red-ant (*Solenopsis geminata* Fabr.) on some of the vegetable crops.**—*Mysore agric. J.* **34** no. 1 pp. 9–14, 1 pl., 6 refs. Bangalore, 1959.

Solenopsis geminata (F.) was found damaging the roots or tubers of several vegetables near Bangalore, potato and brinjal [*Solanum melongena*] being commonly affected. In preliminary tests on the control of this ant, good results were obtained by pouring a 20 per cent. heptachlor emulsion concentrate diluted to 1 oz. in 1·25 gal. water, a 75 per cent. chlordane emulsion concentrate diluted to 1 oz. in 4 gal. water or a 30 per cent. aldrin emulsion concentrate diluted at 1 oz. in 2 gal. water into the entrance holes of the nests, at about 0·5 gal. per nest, or round plants to be protected. Heptachlor was somewhat better than the others.

Singh (Sardar) & Sidhu (H. S.). **Control of mustard aphid by synthetic insecticides.**—*Indian Oilseeds J.* **2** no. 3 pp. 24–31, 8 refs. Hyderabad, 1958. **A schedule for control of mustard aphid by some insecticides.**—*Op. cit.* **3** no. 3 pp. 169–178, 2 refs. 1959.

It is stated in the first of these papers that *Rhopalosiphum pseudobrassicae* (Davis) causes serious reductions in the yield of rape and mustards (*Brassica juncea* and a variety of *B. campestris*) grown as oilseed crops in the Punjab area of India. The life-history of the aphid is briefly described, the literature on its control is reviewed, and an account is given of experiments on its control on all three crops carried out in the winter of 1956–57. Numerous insecticides were tested in sprays and gave good control. Those recommended, on considerations of cost and toxicity hazards, are a 0·25 per cent. BHC suspension, for use on crops not to be used for edible purposes, and a 0·0625 per cent. malathion emulsion spray, which is suitable for general use. Several applications are required.

Further experiments, reported in the second paper, were carried out on *B. juncea* in 1957–58. Eight insecticides were tested in various spray schedules, and the recommendations made from the results obtained comprise five applications of a 0·025 per cent. parathion suspension spray or diazinon emulsion spray at intervals of ten days, beginning at the flower-bud stage, where precautions against toxic hazards can be taken, and similar schedules of BHC, endrin or nicotine sulphate in other circumstances.

Roonwal (M. L.), Chatterjee (P. N.) & Thapa (R. S.). **Prophylactic efficacy of various insecticides in the protection of freshly felled and converted timbers (planks) against insect borers.**—*Indian For. Bull.* (N.S.) Ent. no. 215, [3 +] 45 pp., 9 refs. Delhi, 1959.

Details are given of numerous tests carried out at Dehra Dun in the past few years on the value of insecticides, particularly chlorinated hydrocarbons, for the protection of newly felled timber and planks from boring beetles. It is concluded from the results, which are set out and analysed in detail, that γ BHC in an emulsion, oil solution or wettable-powder spray is the most generally useful insecticide, affording protection for about a year at suitable concentrations. Brushing with creosote, alone or with fuel oil, is also recommended. Notes on the beetles recorded are included.

Matsuzawa (H.), Miyamoto (Y.), Okamoto (H.) & Kawahara (S.). **Studies on the control of the olive weevil, *Hylobius desbrochersi*. I. On the real state of the damage of the olive tree caused by the olive weevil.** [*In Japanese.*]—*Tech. Bull. Fac. Agric. Kagawa Univ.* **8** no. 2 pp. 172–176, 5 figs., 7 refs. Mikityô, Kagawa-ken, 1957. (With a summary in English.) **II. On the morphology, the life history, appearance and the habits of the olive weevil.** [*In Japanese.*]—*T.c.* pp. 177–188, 14 figs., 13 refs. (With a summary in English.) **III. Supplementary study on development.** [*In Japanese.*]—*Op. cit.* **9** no. 3 pp. 129–135, 1 graph, 4 refs. 1958. (With a summary in English.) **IV. On the longevity and the fecundity of the adult weevil.** [*In Japanese.*]—*Op. cit.* **10** no. 1 pp. 36–39, 1 graph, 7 refs. 1959. (With a summary in English.)

Hylobius desbrochersi Zumpt is an important pest of olive trees in Kagawa Prefecture, Japan. Its distribution there and the extent of the damage are reviewed in the first part of this series, based on observations begun in 1954, and the necessity of control measures is emphasised.

Studies on the bionomics of the weevil are reported in the second part, which also contains descriptions of all stages. The adults are nocturnal in habit and hide in the ground or remain motionless on the twigs during the day; they are unable to fly and are long-lived, surviving for over a year. The preoviposition period lasts 2–3 months, after which eggs are laid, at the rate of not more than 1–2 per day, in holes excavated in the lower part of the trunk. The larvae mine in the bark and damage the cambium by feeding, after which they pupate in cells in the outer part of the wood. It appeared that eggs laid in early spring gave rise to adults in summer, those laid in late spring did so in early autumn, and those laid in summer or autumn did so in the early summer of the next year. Adults appear at irregular intervals and are active from the middle or end of March until November. They hibernate in the bush near the groves, or under straw or withered leaves or weeds. Winter is also passed in the larval stage, but no eggs or pupae could be found at that season.

The third part contains the results of observations on the development of the weevil at constant temperatures in the laboratory and on different food-plants. Further field investigations showed that larvae from eggs laid in July–October overwinter, and that newly emerged adults mostly appear in these months.

The studies described in the fourth part showed that the adults of *H. desbrochersi* survived for up to about 1,000 days, with an average of some 600–700 days; there was little difference in this respect between sexes. For females that emerged in summer or autumn, the numbers of eggs laid averaged 15 in the first year and 70–80 in the second and third year, so that about 200 eggs are laid during life.

Tjoa Tjien Mo. **Hasil pertjobaan dengan insektisida² jang mengandung persenjawaan fosfor terhadap** *Plutella maculipennis* **(Curt.) di Lembang (Bandung) jang resisten terhadap DDT, HCH, DSB.** [Results of tests of phosphorus insecticides against chlorinated insecticides resistant *P. maculipennis* in Lembang (West Java).]—*Contr. gen. agric. Res. Sta. Bogor* no. 155, 11 pp., 2 refs. Bogor, 1959. (With a summary in English.)

After the development of resistance to DDT by *Plutella maculipennis* (Curt.) on cabbage in Lembang (West Java) in 1951 [*cf. R.A.E.*, A **41** 441], many growers applied BHC against this pest. This gave good control at first, though it tended to taint the crop, but resistance to it subsequently developed. The use of toxaphene, aldrin and dieldrin met with the same fate, 3–4 times the standard dose ultimately being required for satisfactory control. Phosphorus compounds have been used in the past few years, but since their poisonous nature is little appreciated and there is a danger that they may be applied in excessive amounts, tests were carried out to determine the minimum effective rates of application. In laboratory tests, complete kill of larvae in up to six days was given by 0·05 per cent. trichlorphon (Dipterex), 0·04 per cent. malathion, 0·015 per cent. parathion (Folidol E-605), 0·2 per cent. Chlorthion, 0·4 per cent. endrin and 0·5 per cent. toxaphene. A field test was carried out in 1958–59 in which cabbages were sprayed 11 times at weekly intervals. Excellent control was given by 0·015 per cent. parathion, and 0·04 per cent. malathion, 0·05 per cent. trichlorphon and 0·1 per cent. Chlorthion were satisfactory. Endrin gave good control at 0·4 per cent. (four times the normal concentration), and toxaphene at 0·5 per cent. (three times the normal), but the use of such high concentrations is not advisable.

Passlow (T.). *Heliothis* **as a pest of cotton in central Queensland.**—*Qd J. agric. Sci.* **16** no. 3 pp. 165–176, 1 graph, 11 refs. Brisbane, 1959.

The following is based largely on the author's summary. During 1948–57, 13 tests of the value of DDT and six other recently developed insecticides for the control of *Heliothis armigera* (Hb.) were conducted on irrigated and rain-grown cotton in central Queensland. The results of four tests showed increases in total yield after applications of DDT that were successful in killing *H. armigera*, but the increase was economically significant only in one plot, in which pest incidence was low and an emulsion spray containing 0·4 per cent. DDT was applied twice, at 36 and 48 gal. per acre. In two of six tests that included insecticides other than DDT, schedules of four and five applications of an emulsion spray containing 0·05 per cent. endrin at rates of 50–84 and 60–90 gal. per acre, respectively, resulted in increased total yields, and this is attributed to control of *Cosmophila* (*Anomis*) *flava* (F.); aldrin, BHC, dieldrin, azinphos-methyl (Guthion) and parathion were in general of no value. During 1955–56, investigations were extended to cover the reactions of the plants to destruction of the pests by insecticides. Although good kills of *H. armigera* and most other insects were obtained and there was an increase in the yields from the first pick, there were no differences in total yield. The destruction of *H. armigera* caused the plants to retain larger percentages of early squares and bolls; later, however, fall from sprayed plants was sudden, whereas that from unsprayed plants was gradual. Consequent replacement of squares and bolls was responsible for the levelling of total yields.

Saunders (G. W.). **Toxicities of insecticides to pasture white grubs in Queensland.**—*Qd J. agric. Sci.* **16** no. 3 pp. 239–243, 2 figs., 3 refs. Brisbane, 1959.

In preliminary experiments with insecticides applied to the soil for the control of Melolonthid larvae infesting pastures in Queensland, BHC, aldrin and DDT were much less toxic to *Rhopaea magnicornis* Blkb. and *Lepidiota caudata* Blkb. than to *Dermolepida albohirtum* (Waterh.) and would therefore be of little value where these species are present together.

Passlow (T.). **Bag treatment to control pests of hooded sorghum.**—*Qd J. agric. Sci.* **16** no. 3 pp. 245–248, 1 fig., 1 ref.; also as *Bull. Div. Pl. Ind. Dep. Agric. Qd* no. 141, 4 pp., 1 fig., 1 ref. Brisbane, 1959.

The following is based almost entirely on the author's conclusions from experiments in Queensland. Paper bags dipped completely or partly in an emulsion containing 0·5 per cent. aldrin gave satisfactory protection against *Heliothis armigera* (Hb.), *Cryptoblabes* sp. and *Aphis maidis* Fitch when used to cover sorghum heads to prevent cross-pollination [*cf. R.A.E.*, A **44** 379]. Bags completely impregnated with BHC can be used as a substitute, but bags treated with DDT did not control *A. maidis*.

Hooper (G. H. S.). **A preliminary investigation into control of false wireworm on the Darling Downs.**—*Qd J. agric. Sci.* **16** no. 3 pp. 251–252. Brisbane, 1959.

A species of *Gonocephalum* close to *G. macleayi* (Blkb.) sporadically damages newly germinated cereals on the Darling Downs in Queensland.

In experiments in 1957, BHC diluted in rock phosphate and applied as a drill dressing at 2, 4 or 6 oz. γ isomer per acre controlled the Tenebrionid, and stands on the treated areas were significantly increased.

May (A. W. S.). **DDT for the protection of stored potatoes.**—*Qd J. agric. Sci.* **16** no. 4 pp. 329–353, 3 figs., 15 refs. Brisbane, 1959.

The following is based largely on the author's summary of this account of investigations in southern Queensland in 1949–52. Dusts of 0·5–2 per cent. DDT, 0·75 per cent. rotenone (as derris) or 0·05 and 0·1 per cent. pyrethrins with, respectively, 0·8 and 1·6 per cent. piperonyl butoxide, and sacks impregnated with emulsified solutions of 0·5–2·5 per cent. DDT, were all effective in protecting stored potato tubers from infestation by *Gnorimoschema operculella* (Zell.) when the initial infestation was less than 4 per cent. The DDT dusts and the impregnated sacks all satisfactorily arrested infestations varying from 8 to 35 per cent., but the higher concentrations were more effective when the initial infestation exceeded 20 per cent. The results when strips of burlap or paper treated with DDT were placed among the tubers were inconclusive. A dust of 2 per cent. DDT applied at the rate of ½lb. per standard sack and an emulsified solution of 2 per cent. DDT for sack impregnation were considered the most effective measures for general use. Second-hand light-weight hessian sugar-bags provided a satisfactory alternative to the standard sacks for storing tubers, but multiple-layered paper bags were not suitable under Queensland conditions. In tests of the residues, considerable quantities of DDT were found to be transferred to the tubers when sacks impregnated with DDT were handled. DDT residues on tubers, whether acquired from the sacks or from dust application, persisted during storage but were reduced to safe limits during subsequent handling and preparation for the table.

May (A. W. S.) & Bengston (M.). **Studies on codling moth control in the Granite Belt.**—*Qd J. agric. Sci.* **16** no. 4 pp. 355–363, 14 refs. Brisbane, 1959.

The following is based almost entirely on the author's summary. An account is given of six orchard tests carried out on apple in south-eastern Queensland in 1949–50, 1954–55 and 1956–57 to investigate the value of recent insecticides for control of *Cydia pomonella* (L.). The materials used in the spray programmes tested were DDT, DDD, diazinon, dieldrin, endrin, malathion, methoxy-DDT (methoxychlor) and parathion. Populations of *C. pomonella* varied considerably between orchards and seasons. None of the other materials was superior to DDT, and it was concluded that no alteration of the existing recommended programme against *C. pomonella*, comprising two sprays of 0·1 per cent. DDT, three weeks apart, made to coincide with each of the two periods of major moth activity, was justified.

Hadlington (P.) & Hoschke (F.). **Observations on the ecology of the Phasmatid** *Ctenomorphodes tessulata* **(Gray).**—*Proc. Linn. Soc. N.S.W.* **84** pt. 2 pp. 146–159, 2 pls., 2 figs., 9 refs. Sydney, 1959.

In 1955–56, *Ctenomorphodes tessulata* (Gray) defoliated trees in coastal forests in three widely separated areas of New South Wales. The adults and eggs of this Phasmatid are described, and a key to the nymphal instars is given. The known range of the species, which attacks many trees of the

genera *Eucalyptus*, *Syncarpia*, *Acacia* and *Casuarina*, is restricted to north-eastern New South Wales and south-eastern Queensland, but no outbreaks have been reported from the latter State. In New South Wales, adults were present from December to February or early March, and in 1956 were numerous in January. In that year, oviposition extended over 6–8 weeks. The eggs are laid in the ground litter, and the egg stage, which includes at least one diapause, may last eight months or more in the field. The nymphs ascend the trees soon after hatching. First-instar nymphs were observed in late August and early September, and some fourth- and fifth-instar individuals were found in late September; males passed through six instars and females through seven. Adult males appeared in December, 1–2 weeks earlier than the females. These adults survived for only 4–9 weeks in the field, but for about 4–5 months in the laboratory. The preoviposition period lasted about two weeks, and under laboratory conditions the females each laid 4–10 eggs per day. Eggs kept at room temperature gave rise to healthy nymphs, but nymphs that hatched from eggs kept at a constant temperature of 76°F. were small, did not feed, and soon died.

In the field, a disease of unknown origin and four Hymenopterous parasites, of which *Myrmecomimesis rubrifemur* (Riek) was the commonest, caused high mortality among the eggs; parasitism varied from 7·5 to 20·6 per cent. in April 1956. Dry conditions cause high mortality at hatching and among the first-instar nymphs. The infested tree stands showed considerable similarity in composition, and small numbers of *E. microcorys*, to which other species of *Eucalyptus* are preferred, were often associated with them. Areas of up to 100 acres were severely or completely defoliated by *C. tessulata* in 1955–56, but by midsummer of the following season, when populations were lower, the trees had recovered. The death or stunting of preferred species as a result of repeated defoliation and the consequent increased light penetration are likely to favour the development of stands of *E. microcorys*, though some time would be required for complete restocking owing to the small quantities present. The outbreak in 1955–56 appeared to be correlated with the occurrence of large forest fires in 1951–52, and it is suggested that fires in early spring and summer favour the development of large populations by destroying host eggs containing parasites (which emerge in December and February) on the ground, but not the nymphs of *C. tessulata*, which occur in the crowns, and also by removing bird predators. The reason for the reduction in numbers in 1956–57 is not known.

Moore (K. M.). **Observations on some Australian forest insects. 1. Notes on the biology of the sawfly** *Polyclonus atratus* **Kirby 1882, (family Pergidae, subfamily Euryinae), and some of its parasites.**—*Proc. R. zool. Soc. N.S.W.* 1955–56 pp. 74–81, 8 figs., 8 refs. Sydney, 1957. **2. A biting midge (Diptera: Ceratopogonidae), and mortalities among larvae of Lepidoptera (Limacodidae).**—*Op. cit.* 1956–57 pp. 77–78, 3 refs. 1958. **3. The biology and larval taxonomy of some Lepidoptera attacking trees and timber.**—*Aust. Zool.* **12** pt. 4 pp. 337–350, 3 pls., 12 refs. Sydney, 1959. **4.** *Xyleborus truncatus* **Erichson 1842 (Coleoptera: Scolytidae) associated with dying** *Eucalyptus saligna* **Smith (Sydney blue-gum).**—*Proc. Linn. Soc. N.S.W.* **84** pt. 2 pp. 186–193, 1 pl., 3 figs., 8 refs. Sydney, 1959. **5. Some additional wood-destroying larvae of Lepidoptera and Coleoptera.**—*Proc. R. zool. Soc. N.S.W.* 1957–58 pp. 32–39, 10 figs., 15 refs. Sydney, 1959.

The first paper in this series on forest insects in Australia contains information on the distribution, food-plants, bionomics and parasites of

Polyclonus atratus Kby. Eggs of this sawfly are laid in the leaves of *Eucalyptus saligna* and other trees and in blades of grass growing between the leafy tops of felled trees, and the larvae feed gregariously on the dying and dead leaves of *Eucalyptus* and *Angophora* spp., which they skeletonise. The life-cycle lasts about 12 weeks in warm and up to six months in cool weather. Natural enemies include the fungus, *Beauveria bassiana*, which greatly reduces populations in moist seasons.

In the second paper, females of the Ceratopogonid, *Forcipomyia fuliginosa* (Mg.), are recorded feeding on the larvae of the Limacodid, *Doratifera casta* Scott, which defoliated *E. saligna*, *E. acmenioides* and *A. intermedia* in New South Wales during 1954–56. Considerable mortality occurred among the larvae of *D. casta* through infection by a disease thought to be caused by a virus, and *F. fuliginosa*, which is common in many parts of Australia, is regarded as a possible vector.

In the third paper, ten species of Lepidoptera reared from injured or dead trees and from building timbers during 1953–56, when rainfall was abnormally high, are listed. Most of the larvae fed in sapwood, but heartwood was sometimes attacked. Species of *Barea* predominated, and of these *B. consignatella* Wlk. was the most widespread and numerous. Information on its distribution, food-plants (which include *E. saligna*, *E. acmenioides*, *A. intermedia* and *Podocarpus dacrydioides*), bionomics and natural enemies and on those of four other species as well as descriptions of the last-instar larvae are given, with less detailed accounts for the other five species. Four species of Lepidoptera and one of Coleoptera reared from damaged timber or the wood of dead or unhealthy trees or shrubs during 1957–58 are recorded in the fifth paper, which also contains descriptions of the last-instar larvae and, in some cases, of the injury.

The following is partly based on the author's summary of the fourth paper. High mortality of *E. saligna* on State Forests and private property in coastal areas of New South Wales has recently caused concern, and the reason for the mortality, and also the observed association of attack by *Xyleborus truncatus* (Erichs.) with brown staining in the wood of the dying trees, were accordingly investigated. Information is given on the food-plants, distribution and bionomics of *X. truncatus* and on the damage caused by it, with assessments of the amount of commercial timber destroyed in two areas where tree mortality was greatest. It is concluded that damage by this Scolytid is unlikely to be the direct cause of death. Infested trees were often, though not invariably, weakened by heavy infestation by Psyllids of the genus *Spondyliaspis*, but an unfavourable site may be the principal factor involved.

Rosel (A.). **Project P. 15. *Lyctus* beetle investigations. Sub-project P. 15–8. The toxicity of various preservatives to *Lyctus*. Progress report no. 1. Tests on the toxicity of Tanalith U, Boliden BIS, arsenic pentoxide, boric acid and zinc sulphate to *Lyctus*.**—14+ii pp., 1 pl., 4 refs., multigraph. Melbourne, For. Prod. Lab., Commonw. sci. industr. Res. Org., 1958.

In connection with work on the protection of timber from attack by *Lyctus brunneus* (Steph.) in Australia, the minimum core retentions of some proprietary preparations and other materials of known or possible value in control were determined in laboratory tests. Blocks of sapwood of *Argyrodendron trifoliatum*, *Flindersia rubescens* and *Cinnamomum laubatii* were impregnated under pressure with the test materials, placed on sterile soil in jars and conditioned at 78°F. and 75 per cent. relative humidity for at

least two weeks, after which they were exposed to attack by laboratory-bred adults of *L. brunneus* for at least 13½ months. The materials tested were Tanalith U [disodium hydrogen arsenate, sodium chromate, sodium fluoride and dinitrophenol (*cf. R.A.E.*, A **49** 264)], Boliden BIS (prepared in the laboratory and containing 14·7 per cent. fused arsenic pentoxide, 31·8 per cent. sodium arsenate, 14·5 per cent. sodium dichromate and 39 per cent. zinc sulphate), boric acid, arsenic pentoxide and zinc sulphate. The minimum lethal concentrations were found to be influenced by the nutritional content of the wood, and the values given are accordingly based on toxic thresholds determined for *A. trifoliatum*, the most susceptible species. The percentage dry-salt retentions (on an oven-dry weight basis) that prevented or, in the case of boric acid, permitted only negligible, larval activity and, in brackets, the safe concentrations calculated from them averaged 0·043 (0·056) for Tanalith U, 0·113 (0·134) for Boliden BIS, 0·037 (0·051) for arsenic pentoxide and 0·22 (0·29) for boric acid [*cf.* **27** 510]. Zinc sulphate did not prevent attack, even at the highest retention tested (2·486 per cent.).

Begg (J. A.) & Harris (C. R.). **Preliminary report on control of the black cutworm, *Agrotis ypsilon* (Rott.), with aldrin incorporated into the soil in various ways.**—*Rep. ent. Soc. Ont.* **89** (1958) pp. 45–47, 3 refs. Guelph, Ont., 1959.

The following is based on the authors' summary of this account of experiments in Ontario in 1958. Aldrin at 1·7 lb. per acre sprayed on the soil surface as an emulsified solution or applied in fertiliser, and cultivated or drilled to various depths into a sandy loam soil, did not control an artificial infestation of *Agrotis ypsilon* (Hfn.) in flue-cured tobacco for the first three days after the plots were infested. During the next three days, the surface spray harrowed 1–2 in. or disked 4–6 in. into the soil, and the broadcast fertiliser mixture harrowed into the soil, allowed 18 per cent. or fewer injured plants, in comparison with 39 per cent. in the untreated plots. At 6–9 days, the surface treatments harrowed into the soil reduced injury from 11 to 4 per cent. or less. The surface spray disked into the soil was significantly less effective, and the fertiliser mixture drilled 1–2 or 3–4 in. into the soil provided no protection. Close-planting the tobacco and 15-ft. buffer areas of fallow land apparently did not prevent the cutworms from moving between plots.

Fox (C. J. S.). **Influence of vegetation on distribution of wireworms, *Agriotes* spp., in grassland: a progress report.**—*Rep. ent. Soc. Ont.* **89** (1958) pp. 47–49, 5 refs. Guelph, Ont., 1959.

Wireworms of the genus *Agriotes* occur unevenly in grassland, but little is known of the influence of different types of plant cover on their distribution. A long-term study was begun in a heavily infested old hay field near Digby, Nova Scotia, in 1953. The field was about 350 ft. above sea-level, and the soil was a brown shaly loam in a fair state of fertility, rich in organic matter, with an average pH of 5·4. Soil cores were taken to a depth of 8 in. at about monthly intervals from May to October in six years and examined for the plants present, the percentage of the surface covered by foliage and the number of wireworms present. The results, when bare ground and infrequent plant species were ignored, indicated that the habitats, in order of decreasing wireworm abundance, were among the roots of wild carrot (*Daucus carota*), rib grass (*Plantago lanceolata*), grasses (chiefly

Phleum pratense and *Poa pratensis*), clovers (*Trifolium repens* and *T. pratense*), dandelions (*Leontodon autumnalis* and *Taraxacum officinale*) and hawkweeds (*Hieracium* spp.); as the cover of hawkweeds increased the number of wireworms found declined, and there was no evidence that these plants were fed upon. The evidence suggested that the site of an aggregation of larvae was determined, indirectly at least, by the influence of the vegetation on the ovipositing females, possibly acting through the moisture requirements of the beetles.

James (H. G.). **Egg development, hatching, and prey taken by the European mantis,** *Mantis religiosa* **L., in several habitats.**—*Rep. ent. Soc. Ont.* **89** (1958) pp. 50–55, 1 graph, 4 refs. Guelph, Ont., 1959. **New records of the European mantis,** *Mantis religiosa* **L. (Orthoptera: Mantidae), in Ontario.**—*T.c.* p. 70, 3 refs.

The European mantis, *Mantis religiosa* (L.), was introduced into Ontario some 50 years ago and now occurs throughout most of the agricultural land in the south of the Province; recent records are noted in the second paper. It is of some importance as a predator of pasture insects, but its numbers fluctuate widely, even in areas in which it is well established. Low winter temperatures kill many of the eggs, but not sufficient to account for the variations, and field studies, described in the first paper, were made in 1943–55. The following is based on the author's summary of part of the results.

In 1953–54, the development of the eggs in late autumn in several habitats near Chatterton was more advanced on a hill-side pasture than in a flood-meadow or a drained pasture. The trend was the same in spring, but there was no significant variation in the percentage hatch between the flood-meadow eggs and those from the other fields. Hatching in the three habitats observed occurred from 2nd to 17th June; small numbers of nymphs hatching from oothecae near the ground were destroyed by workers of *Formica lasioides* Emery and of *Myrmica* sp. The flood-meadow contained 4–5 times as many nymphs as did a field station pasture in June, but the ratio was reduced to 2:1 at the end of the summer. Eventually, more and larger egg-masses were laid in the meadow, where prey was more abundant. Rearing, dissections and casual field records indicated that the adults and larger nymphs feed extensively on Orthoptera, especially field crickets. The abundance of crickets is important in maintaining the mantis locally.

McClanahan (R. J.), Harris (C. R.) & Miller (L. A.). **Resistance to aldrin, dieldrin, and heptachlor in the onion maggot,** *Hylemya antiqua* **(Meig.), in Ontario.**—*Rep. ent. Soc. Ont.* **89** (1958) pp. 55–58, 4 refs. Guelph, Ont., 1959.

The following is based on the authors' introduction and summary. *Hylemyia antiqua* (Mg.) was effectively controlled on onion in Ontario in 1953–57 by treatment with aldrin, dieldrin or heptachlor, but severe damage occurred in 1958 in fields that had been treated with aldrin or dieldrin before planting. In laboratory tests, 81, 37 and 85 per cent. of the adults from an area where aldrin had been used for five years survived 1 per cent. sprays of aldrin, dieldrin and heptachlor, respectively, whereas no adults from an area where aldrin had been used for only three years survived 0·1 per cent. sprays. Fenchlorphos (Korlan), diazinon, parathion and methyl-parathion gave 100 per cent. mortality of flies from both areas at concentrations of

0·01 per cent. Aldrin-resistant strains were found by similar tests to exist in all the major onion-growing areas in Ontario (except Erieau Marsh) and in the Ste. Clothilde region of Quebec.

Blakeley (P. E.) & Jacobson (L. A.). **Effects of temperature, humidity, and larval weight on the duration of prepupal and pupal stages of the pale western cutworm,** *Agrotis orthogonia* **Morr. (Lepidoptera: Noctuidae).**—*Canad. Ent.* **92** no. 3 pp. 161–163, 9 refs. Ottawa, 1960.

The following is virtually the authors' summary. When prepupae and pupae of *Agrotis orthogonia* Morr. were reared at three levels of humidity (saturation deficits of 3·2, 11·9 and 15·8 mm.) at 20, 25 and 30°C. [68, 77 and 86°F.], differences were found in the duration of these stages at the various temperatures but not between humidities. There was no difference in the duration of the pupal stage between sexes. The duration of the pupal stage varied inversely, and the prepupal stage directly, with temperature. The longer prepupal stage at 30°C. was considered a form of diapause, which enables this cutworm to remain as a single-brooded species in the wide variation of climate from the prairies of Canada to Texas. A positive association was found between the weights of prepupae and pupae and the duration of these stages.

Jacobson (L. A.) & Blakeley (P. E.). **Survival, development, and fecundity of the pale western cutworm,** *Agrotis orthogonia* **Morr. (Lepidoptera: Noctuidae), after starvation.**—*Canad. Ent.* **92** no. 3 pp. 184–188, 8 refs. Ottawa, 1960.

The following is virtually the authors' summary. Larvae of *Agrotis orthogonia* Morr. at different stages of development were starved at 25°C. [77°F.] for various intervals and compared with larvae that were fed continuously. Starvation during the first five instars resulted in mortality, prolongation of the larval period, occurrence of supernumerary moults and lighter-weight pupae [*cf. R.A.E.*, A **48** 68; **49** 187]. Similar effects were obtained when larvae were starved in the ultimate instar except that mortality was reduced and there was a slight acceleration in larval development. Fecundity was reduced by starvation, as the pupae and the adults were smaller. Prolonged starvation caused mortality, the percentage of which was dependent on the size of larvae, and the final percentage mortality was greater than the mortality at the time when the larvae were allowed to resume feeding.

Hildahl (V.) & Reeks (W. A.). **Outbreaks of the forest tent caterpillar,** *Malacosoma disstria* **Hbn., and their effects on stands of trembling aspen in Manitoba and Saskatchewan.**—*Canad. Ent.* **92** no. 3 pp. 199–209, 3 figs., 14 refs. Ottawa, 1960.

The following is virtually the authors' summary. Infestations of *Malacosoma disstria* Hb. occurred on trembling aspen [*Populus tremuloides*] in Manitoba and Saskatchewan almost every year from 1923 to 1953. These infestations can be recognised as constituting several outbreaks, all differing in their directions of extension. Outbreaks in the early 1950's ended abruptly [*cf. R.A.E.*, A **45** 6], and infestations in individual stands generally caused almost complete defoliation over not more than two years. This

degree of defoliation was not sufficiently severe to cause appreciable tree mortality, but it caused increment loss estimated at 8·4 per cent. of the total basal area in stands covering about 1½ million acres of aspen in the two Provinces.

Miller (L. A.) & McClanahan (R. J.). **Life-history of the seed-corn maggot, *Hylemya cilicrura* (Rond.) and of *H. liturata* (Mg.) (Diptera: Anthomyiidae) in southwestern Ontario.**—*Canad. Ent.* **92** no. 3 pp. 210–221, 4 figs., 33 refs. Ottawa, 1960.

The following is substantially the authors' summary of this account of investigations carried out in 1951–58. *Hylemyia cilicrura* (Rond.) and the closely related *H. trichodactyla* (Rond.) (*liturata* (Mg.)) usually occur together in infestations in south-western Ontario. They are the most serious soil pests of beans (*Phaseolus* spp.), soy beans and peas and also infest cruciferous crops, cereals, potatoes, cucurbits, maize, tobacco, onions, peppers [*Capsicum*], buckwheat and lucerne. Examination of over 2,000 males indicated that the ratio of *H. cilicrura* to *H. liturata* was 9:1; the sex ratio of *H. cilicrura* was 1:1. Adults emerged from mid-April to early December. There are usually four generations a year. The first two are large and economically important; the third and fourth are small and economically unimportant. The adults are active mainly at temperatures between 60 and 85°F. Hovering and swarming were observed annually and are possibly associated with mating. The species are primarily saprophagous. Females are attracted to newly disturbed soil, which stimulated them to oviposit. Infestations are thus determined mainly by cultural operations rather than by the food-plant species, and potential infestations are often present in the soil before the crop is planted. Adults are preyed upon by an Anthomyiid, *Coenosia tigrina* (F.); the Staphylinid, *Aleochara bipustulata* (L.), and a Cynipid parasite tentatively determined as *Trybliographa ruficornis* (Ashm.) were reared from the puparia. None is considered an important natural control agent.

Burnett (T.). **A technique for maintaining acarine predator-prey populations.**—*Canad. Ent.* **92** no. 3 pp. 234–237, 3 figs., 1 ref. Ottawa, 1960.

In the technique described, stocks of mites to be used as prey in rearing populations of predacious mites are initiated from individual females in micro-cells of a type described in a paper already noticed [*R.A.E.*, A **47** 441]. Prey individuals numbering up to 400 can be reared in a cage of which the sides comprise four acrylic plastic blocks, 4 × 1 in., each with an aeration hole covered with bolting cloth, and the bottom a piece of glass to which the sides are sealed by means of modelling clay. In the plastic top there is a circular hole, normally plugged with a rubber stopper, through which the mites are introduced; the top and bottom are held together in a wooden frame, and food is supplied in a small petri dish. The predators are reared in a similar cage, 6½ × 6½ × 2⅜ in., in which food is supplied in 144 vials, each 9 × 30 mm. In this cage, at 76°F. and 80 per cent. relative humidity, populations of *Tyrophagus castellanii* (Hirst) and its predator, *Melichares dentriticus* (Berl.), were kept on a diet of wheat flakes sieved to pass through 16–20 meshes per inch, supplemented with 0·25 per cent. brewers' yeast and a mould inhibitor, and populations of *Tyroglyphus farinae* (Deg.) (*Acarus siro*, auct.) and its predator, *Cheyletus eruditus* (Schr.), on flakes sieved to pass a screen of 20–30 mesh, supplemented with 2 per cent. raw wheat germ

(80 mesh) and a mould inhibitor, both without a change of food for over a year. For hygienic reasons, populations are usually kept for only 4–5 months.

Clark (R. C.) & Brown (N. R.). **Studies of predators of the balsam woolly aphid,** *Adelges piceae* **(Ratz.) (Homoptera: Adelgidae). VII.** *Laricobius rubidus* **Lec. (Coleoptera: Derodontidae), a predator of** *Pineus strobi* **(Htg.) (Homoptera: Adelgidae).**—*Canad. Ent.* **92** no. 3 pp. 237–240, 2 figs., 8 refs. Ottawa, 1960.

This part of a series on the predators of *Chermes* (*Adelges*) *piceae* Ratz. on balsam fir [*Abies balsamea*] in eastern Canada [*cf. R.A.E.*, A **48** 529] deals with the indigenous *Laricobius rubidus* Lec. All stages of this Derodontid closely resemble those of the introduced *L. erichsonii* Rosenh. [*cf.* **48** 68], for which it has often been mistaken. It was formerly known to feed only on *Chermes* (*Pineus*) *strobi* (Htg.), which is common on eastern white pine (*Pinus strobus*), and its distribution probably extends over that of this tree. Two males were recorded from an infestation of *C. piceae* and three males of *L. erichsonii* from infestations of *C. strobi* in central New Brunswick in 1958, but since the females of the two cannot be separated with certainty, it is not known whether either attacks both aphids. Overwintered adults were active from about 24th March to 1st June, and mating was observed from 31st March to 5th May. In April 1959, adults were collected from infested pines of all sizes, usually from smooth bark on the trunk near the base of large branches and below branch whorls, where *C. strobi* tends to be numerous, but occasionally elsewhere on the trunk and branches. Feeding was not observed, but the intermediate stages and adults of *C. strobi* are present when adults of *L. rubidus* are active, between about 25th April and 20th May, and the eggs are available from mid-May. The eggs of *L. rubidus* are laid singly in the waxy secretion of the prey, or within the egg-mass, between mid-April and about the end of May, and hatch within a week. Larvae are present for about two months and feed on all stages of *C. strobi*. Pupation begins in the second half of June and probably takes place in the soil. Adults, which overwinter in the soil, were not observed after late June, but some evidence was obtained of a partial second generation. Fairly heavy infestations of *C. strobi* persist on *P. strobus* without causing noticeable damage, and it appears that *L. rubidus* and *Leucopis* (*Neoleucopis*) *pinicola* Mall., another predator that is common on infested pines in central New Brunswick, limit infestation but reach a balance with it when it is still fairly high.

Everly (R. T.). **Evaluation of population estimates and the rate of loss of forage for the meadow spittlebug,** *Philaenus leucophthalmus* **(L.).**—*Proc. Ind. Acad. Sci.* **68** (1958) pp. 171–185, 4 graphs, 11 refs. Indianapolis, Ind., 1959.

Methods of estimating populations of *Philaenus leucophthalmus* (L.) on leguminous forage plants were studied in Indiana in 1950, and the following is based on the author's summary of the results. Of six methods critically evaluated, four were compared statistically. The numbers of froth masses per sq. ft. and of adults per net-sweep and visual ratings of population were highly significantly correlated with actual counts of nymphs per sq. ft. The relationships of masses and adults with nymphs was linear, while that of visual ratings and nymphs was curvilinear and best expressed by a second

degree parabola. Experiments to measure the forage yield of red clover [*Trifolium pratense*] when subjected to different levels of infestation indicated that there was a reduction of 11·3 lb. cured hay per acre for each additional nymph per sq. ft. over a population range of 2·2–64 nymphs per sq. ft. Large-scale tests in fields of mixed hay using the numbers of adults per net-sweep gave a reduction of 15·8 lb. cured hay per acre for each adult per sweep. In the experiment in which adult populations were correlated with nymphal populations, a ratio of 114 adults to 100 nymphs was found. Using this ratio, the rate of loss in the field tests would average 13·8 lb. hay per acre per nymph per sq. ft. The relation of hay yields and spittlebug adults was curvilinear and best expressed by the power log curve.

Gould (G. E.). **Varietal susceptibility of cucurbits to cucumber beetle attack.**—*Proc. Ind. Acad. Sci.* **68** (1958) pp. 186–189, 3 refs. Indianapolis, Ind., 1959.

The following is virtually the author's summary. In tests in Indiana, varieties of squash belonging to the species *Cucurbita moschata* were found to be less affected by the feeding of *Acalymma vittata* (F.) than were varieties of *C. maxima* and *C. pepo*. Differences were apparent not only in the number of plants dying from feeding and bacterial wilt, but also from the length of vines at thinning time and the yields of fruits at harvest. Butternut squash showed the least effects of beetle attack, and Hubbard squash the greatest. In some seasons, the beetles destroyed most or all of the plants in the Hubbard plots and many in the Butternut plots before harvest. Of the other cucurbits used in the tests, cucumbers and muskmelons were more affected than watermelons, but not as much as the varieties of *C. maxima*. The Hubbard squash attracted many more beetles than did the Butternut squash, cucumbers and muskmelons. The predominant direction of early beetle migration was from the north-east.

Cox (H. C.) & Lieberman (F. V.). **Biology of the brown wheat mite.**—*J. econ. Ent.* **53** no. 5 pp. 704–708, 1 fig., 18 refs. Menasha, Wis., 1960.

In greenhouse tests in Utah and Idaho in 1955–58, in which examples of *Petrobia latens* (Müller) were caged singly on plants of wheat or barley, the incubation period averaged 8·5–11·2 days for non-diapause eggs; the one larval and two nymphal stages totalled 9·8–11 days, two-thirds of the time being spent as periods of quiescence after each, and were less dependent on temperature than the incubation period; and adult life ranged from 21·5 to 10·6 days and egg-production from 57 non-diapause or 34 diapause eggs to 27 non-diapause or 8 diapause eggs in different years [*cf. R.A.E.*, A **40** 116]. Diapause in summer eggs lasts for an indefinite period during hot, dry weather, after which soil moisture generally initiates hatching within a few days during periods of favourable warmth. In the laboratory, the addition of moisture caused hatching in a few days if diapause had been completed, but had no effect if it had not, even when the shell was removed from the egg. Excessive moisture was detrimental to other stages.

Field observations showed that the diapause eggs were the means by which the mite survived the hot, dry summer and the source of autumn infestation of grain crops; they were furthermore the most successful overwintering stage, the viability of overwintering non-diapause eggs being very poor, and no active stages were present in spring until the diapause

eggs began to hatch. The effects of climate on abundance and feeding habits are discussed; populations on the plants varied greatly throughout the day, being greatest in the morning and evening, when temperatures were 70–80°F.

Pfrimmer (T. R.), Lloyd (E. P.), Merkl (M. E.) & Furr (R. E.). **Field experiments with several insecticidal sprays against the boll weevil and bollworm.**—*J. econ. Ent.* **53** no. 5 pp. 711–714. Menasha, Wis., 1960.

In experiments on cotton in 1957–58 at Stoneville, Mississippi, with emulsion sprays, mostly applied at 6–6·5 U.S. gal. per acre, seven applications of a mixture affording 0·25 lb. azinphos-methyl (Guthion) and 0·5 lb. DDT per acre in August and September gave outstanding control of *Anthonomus grandis* Boh. In sprays applied 7–16 times in June–September, 2 lb. Sevin (in the form of a dispersed solid) and mixtures of 2 lb. toxaphene and 0·5 lb. malathion, of 0·5 lb. Monsanto CP-7769 (hexaethyl ethylthiomethylidynetriphosphonate) or 0·25 lb. methyl-parathion with 0·5 lb. DDT and of 0·5 lb. malathion or 2 lb. toxaphene with 1 lb. DDT per acre gave generally satisfactory control, but 1 lb. fenchlorphos (ronnel) with DDT gave variable results, and Thiodan, toxaphene (alone) and endrin were not effective. Sevin and the mixtures of fenchlorphos, toxaphene, azinphos-methyl, methyl-parathion and malathion with DDT were effective against *Heliothis zea* (Boddie).

In cage tests, azinphos-methyl with DDT showed much more prolonged effect against *A. grandis* than did Thiodan, Sevin or mixtures of fenchlorphos or CP-7769 with DDT.

McMurtry (J. A.) & Stanford (E. H.). **Observations of feeding habits of the spotted alfalfa aphid on resistant and susceptible alfalfa plants.**—*J. econ. Ent.* **53** no. 5 pp. 714–717, 4 refs. Menasha, Wis., 1960.

The following is substantially the authors' abstract. *Therioaphis maculata* (Buckt.) soon assumed a feeding position when put on either resistant or susceptible lucerne in the laboratory, but became restless in 1–4 hours on the former and eventually died or left the plants; little or no honeydew was produced on resistant plants, but a great deal on susceptible ones. Survival was as high among insects placed first on resistant plants and later transferred to susceptible ones as among those transferred from susceptible to other susceptible ones, indicating no residual toxic effect from the resistant plants. Aphids on highly resistant plants were found to die at nearly the same rate as those with no food. Microscopic examination of leaf sections indicated that phloem tissue is the principal feeding site, and it was observed that the setal tubes entered the phloem less frequently in resistant than in susceptible plants, which suggests that the mechanism for locating the phloem was affected on the former. The results indicate that the death of the aphids on highly resistant plants is due to starvation or desiccation, resulting from failure to ingest enough plant sap.

Gambrell (F. L.) & Gilmer (R. M.). **The influence of insecticide-fungicide spray programs on the growth of apple nursery trees.**—*J. econ. Ent.* **53** no. 5 pp. 717–719, 3 refs. Menasha, Wis., 1960.

Empoasca fabae (Harris), *Aphis pomi* Deg., *Eriosoma lanigerum* (Hsm.), *Lygus lineolaris* (P. de B.) and powdery mildew (*Podosphaera leucotricha*)

all affect the growth and quality of young apple trees in nursery plots in New York, and tests to measure their effect and to devise satisfactory methods for their control were made. Sprays were applied at intervals of a fortnight, three times in June–July 1956, five times in May–August 1957 and five times in May–July 1958. Sulphur was the most effective fungicide, and sprays containing 2 lb. 50 per cent. wettable DDT with either 1 U.S. pint 62 per cent. demeton emulsion concentrate or 1 lb. 25 per cent. wettable lindane [almost pure γ BHC] per 100 U.S. gal. gave excellent control of the insects. The effects of adequate control of insects and disease appeared to be cumulative over the three-year period, but considerable differences in resultant tree growth were evident in different varieties. Less vigorous varieties showed a greater benefit from spraying than did stronger ones, but significant gains were observed in all.

Osburn (M. R.), Dawsey (L. H.) & Woodham (D. W.). **Insecticide residues on forage under sprayed pecan trees.**—*J. econ. Ent.* **53** no. 5 pp. 719–721, 3 refs. Menasha, Wis., 1960.

The following is based on the authors' abstract. In view of the need to know when it is safe to allow livestock to graze in sprayed pecan orchards, experiments were carried out in Georgia in 1957–59 to determine the extent to which insecticide residues accumulate and persist on the forage under sprayed trees. Three applications of 2 lb. 15 per cent. wettable azinphos-methyl (Guthion) or parathion or 25 per cent. wettable EPN per 100 U.S. gal. or two of 6 lb. 40 per cent. wettable toxaphene to pecan trees at intervals of a fortnight resulted in initial deposits of 1–60, 4–28, 24–76 and 488–672 parts per million, respectively, on the grass cover, chiefly Bermuda grass [*Cynodon dactylon*], under the trees. Two weeks after any application, parathion residues were below 1 p.p.m. (with one exception during a dry period), and azinphos-methyl, EPN and toxaphene residues were 0·6–10·3, 0·4–5·3 and 69–126 p.p.m., respectively; 23 p.p.m. toxaphene remained ten weeks after the second application.

Barnes (O. L.). **Observations on the desert grasshopper, *Trimerotropis pallidipennis pallidipennis*, in Arizona.**—*J. econ. Ent.* **53** no. 5 pp. 721–724, 2 refs. Menasha, Wis., 1960.

The following is substantially the author's abstract. *Trimerotropis pallidipennis pallidipennis* (Burm.) was one of the most widely distributed grasshoppers in Arizona, with the most widely varied habitat, in 1936–59. Average populations were greater at moderate than at very low or very high elevations. The heaviest and most extensive infestations occurred in 1941 and 1958, mainly on non-irrigated desert land in south-central Arizona after continuous periods of heavy rainfall and favourable conditions of vegetation from autumn to spring. The grasshopper often migrated into cultivated land and damaged crops; there was severe injury to seedling cotton in Pinal and Maricopa Counties in 1958. *T. pallidipennis* completed a generation in spring throughout its range in Arizona, and there was usually at least one more during the year at elevations below 5,000 ft. Desert populations were reduced by 74 per cent. in one day and by 86 per cent. in 6–7 days by an application of 2 oz. aldrin in 1 U.S. gal. diesel fuel oil per acre from aircraft on 5th–6th May 1958.

Reynolds (H. T.), Fukuto (T. R.) & Peterson jr. (G. D.). **Effect of topical applications of granulated systemic insecticides and of conventional applications of other insecticides on control of insects and spider mites on sugar beet plants.**—*J. econ. Ent.* **53** no. 5 pp. 725–729, 3 refs. Menasha, Wis., 1960.

As sugar-beet is sown in autumn in the Imperial Valley of California, it is sometimes necessary to apply chemicals to control heavy infestations of insects and mites in spring, when the foliage is dense and plant coverage difficult. In tests in 1957–59, topical applications of granules of phorate and Di-Syston (O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate) at about 1 lb. toxicant per acre, in which the granules were allowed to flow gently along and over the plant row, so that most of them rolled down the leaves on to the plant crown, resulted in excellent and persistent reductions in the numbers of *Myzus persicae* (Sulz.), *Empoasca solana* DeLong and *Tetranychus cinnabarinus* (Boisd.) the most important pests after the plants have passed the seedling stage. No residues of either compound were detected in the roots, but 0·07 part phorate per million was found in the foliage 29 days after application. Of the other materials tested, Thiodan in granules or spray gave excellent mortality of *M. persicae*, Sevin, parathion and ethion sprays were promising against *E. solana*, and ethion and demeton sprays and Kelthane and Trithion dusts effectively reduced populations of *T. cinnabarinus*.

Asquith (D.). **Three plans for using acaricides to control mites on apple.**—*J. econ. Ent.* **53** no. 5 pp. 735–737. Menasha, Wis., 1960.

The author describes tests in which acaricides were applied twice in 1958 and three times in 1959 against *Panonychus ulmi* (Koch) and *Tetranychus telarius* (L.) on apple in Pennsylvania; in one series, Aramite (2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite) and Kelthane at 2 lb. and Tedion and dimethoate at 0·5 lb. per 100 U.S. gal. were used alone in all applications, and in the others they were used in pairs, either alone at full strength in alternate applications or combined at half strength in all applications, Aramite in 1958 and dimethoate in 1959 with Tedion or Kelthane and Tedion with Kelthane in each year. All treatments gave satisfactory control of the mites, but the mixtures of acaricides in consecutive applications tended to give better results than the same pairs in alternate applications and than the weaker of the two used alone in all applications.

Dietz (S. M.) & Harwood (R. F.). **Host range and damage by the grass mealybug, *Heterococcus graminicola*.**—*J. econ. Ent.* **53** no. 5 pp. 737–740, 8 figs., 3 refs. Menasha, Wis., 1960.

Heterococcus graminicola Morr., which was known from wheat, maize and six species of wild grasses on the eastern and western seaboard of the United States, Utah, Minnesota and Ohio, was found attacking 67 species and one variety, representing 23 genera, in a survey of grasses at a plant introduction nursery at Pullman, Washington, in 1957. Notes are given on the life-history of the mealybug and the damage it causes. Burning in late summer and autumn reduces the overwintering populations. No damage sufficient to warrant the use of insecticides has been observed, but experiments showed that an application of 1 lb. malathion or 0·5 lb. phorate or Trithion per acre in March, when the young crawlers are active and before many have become established in protected areas, is effective.

Blickenstaff (C. C.). **Effect of sample location within fields on corn earworm and rice weevil infestation and damage.**—*J. econ. Ent.* **53** no. 5 pp. 745–747, 1 fig., 4 refs. Menasha, Wis., 1960.

The following is based on the author's introduction and abstract. In surveys of the damage caused to field maize by *Heliothis zea* (Boddie), the uniformity of infestation or damage within fields is an important consideration; if marginal effects are considerable, they should be taken into account so as to result in representative sampling. Fields surveyed for damage by *H. zea* in Georgia in 1957 were sampled schematically to determine whether such marginal effect was present, and infestation by *Sitophilus oryzae* (L.) was recorded at the same time. Analysis of the data from ten fields showed no significant effect of sample location in relation to field margins on rate of infestation or damage by *H. zea*, but a highly significant effect on the percentage of ears infested by *S. oryzae*, which declined regularly from the margin to the centre.

Cowan jr. (C. B.), Davis (J. W.) & Parencia jr. (C. R.). **Field experiments against several late-season cotton insects in 1959.**—*J. econ. Ent.* **53** no. 5 pp. 747–749, 4 refs. Menasha, Wis., 1960.

The following is based on the authors' introduction and abstract. Heavy infestations on cotton in central Texas late in the season of 1959 afforded an opportunity for the evaluation of several new insecticides in the field; *Anthonomus grandis* Boh. and *Heliothis zea* (Boddie) were the predominant pests, and *Aphis gossypii* Glov., *Tetranychus desertorum* Banks and *Alabama argillacea* (Hb.) were also present. Sprays were applied 7–9 times in July and August against the first two. In mixtures with DDT, Strobane was as effective against both insects as toxaphene. Azinphosmethyl (Guthion) with DDT gave better control of *Anthonomus* than did Shell SD-3562 (dimethyl 1-dimethylcarbamoyl-1-propen-2-yl phosphate) or Shell SD-4402 (1,3,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanophthalan), but was no better than Shell SD-5539 [dimethyl 1-(m-nitrobenyloxycarbonyl)-1-propen-2-yl phosphate] combined with DDT, and Sevin was better than Geigy G-30494 (O,O-dimethyl S-2,5-dichlorophenylthiomethyl phosphorodithioate) with DDT but not superior to Bayer 25141 (O,O-diethyl O-p-methylsulphinylphenyl phosphorothioate). Against *H. zea*, SD-4402 was effective, but SD-3562 was not, and Bayer 25141 was less effective than standard materials. Sevin was as effective in a dust against either insect as in a wettable-powder spray.

In single spray applications in August, demeton, ethion, Trithion, Bayer 25141, SD-3562 and G-30494 were equally effective against *Aphis gossypii* and also against *T. desertorum*, and Sevin, SD-3562 and SD-4402 were as effective as methyl-parathion against *Alabama argillacea*; a wettable-powder spray containing spores of *Bacillus thuringiensis* showed some promise for the control of *A. argillacea*.

Doering (G. W.) & Randolph (N. M.). **Field methods to determine the infestation of the sorghum webworm and the damage by the sorghum midge in grain sorghum.**—*J. econ. Ent.* **53** no. 5 pp. 749–750. Menasha, Wis., 1960.

Celama sorghiella (Ril.) [*cf. R.A.E.*, A **26** 279] and *Contarinia sorghicola* (Coq.) are of economic importance on grain sorghum in Texas, and different

methods of sampling were evaluated for estimation of the damage that they cause. There was no significant correlation between field estimates, made by twice opening the head longitudinally and counting the visible larvae of *Celama*, and counts of total numbers per head in two tight-headed varieties, but a significant correlation, with a ratio of about 1:5, in two open-headed varieties, in which examination of as few as five heads in 30 different areas in large fields may be ample for an accurate estimation of the population. An infestation of 1–5 larvae per head is apparently enough to warrant chemical control. Estimation of damage by *Contarinia*, made by counting the percentage of sorghum heads blasted by the midge, had a more significant correlation with yield when 25 heads were examined than when only ten were used.

Holbrook (R. F.), Beroza (M.) & Burgess (E. D.). **Gypsy moth (*Porthetria dispar*) detection with the natural female sex lure.**—*J. econ. Ent.* **53** no. 5 pp. 751–756, 2 figs., 7 refs. Menasha, Wis., 1960.

The following is substantially the authors' abstract. Traps baited with the sex lure secreted by the females of *Lymantria* (*Porthetria*) *dispar* (L.) attract and ensnare the flying males and can be used to survey large wooded areas in the United States for the presence of the moth [*cf. R.A.E.*, A **41** 281]. Control measures are applied along the borders of infested areas to prevent further spread of the insect. The effect of the design and colour of the trap, its height above ground and position with regard to local terrain and vegetation and of the type of bait dispenser and strength of bait on numbers captured and the method of collecting the attractant are discussed. It appeared that traps could be set out in the field several weeks before normal flight began without impairing the attraction of the bait throughout a normal season.

Flanders (S. E.). **The status of San Jose scale parasitization (including biological notes).**—*J. econ. Ent.* **53** no. 5 pp. 757–759, 17 refs. Menasha, Wis., 1960.

The following is substantially the author's abstract. The marked reduction in abundance of *Quadraspidiotus perniciosus* (Comst.) on fruit trees in the United States in the years after its accidental introduction from China was correlated with its acquisition of a parasite fauna, of which the most important members are two ectoparasites, *Aphytis diaspidis* (How.) and *A. mytilaspidis* (LeB.), and two endoparasites, *Coccophagoides kuwanae* (Silv.) and *Prospaltella perniciosi* Tower. *Q. perniciosus* and *P. perniciosi* are presumably native to China, and both were accidentally introduced into Australia, the United States and Brazil. *P. perniciosi* has been introduced into Chile, Italy, Germany and South Africa as a control measure. Parasitism of the scale evidently reduced the incidence of infestations and enhanced the effect of artificial measures.

Adkisson (P. L.), Vanderzant (E. S.), Bull (D. L.) & Allison (W. E.). **A wheat germ medium for rearing the pink bollworm.**—*J. econ. Ent.* **53** no. 5 pp. 759–762, 13 refs. Menasha, Wis., 1960.

Adkisson (P. L.), Bull (D. L.) & Allison (W. E.). **A comparison of certain artificial diets for laboratory cultures of the pink bollworm.**—*T.c.* pp. 791–793, 8 refs.

The following paragraphs are based on the authors' abstracts of these two papers, respectively.

An artificial medium for the laboratory culture of *Pectinophora gossypiella* (Saund.) is described; it has wheat-germ meal as the primary constituent and also contains vitamin-free casein, sucrose, Wesson's salts, choline chloride, agar, sodium alginate, vitamins and water. The rate of development of *P. gossypiella* on it approximated to that reported for the insect in the field, the larval, prepupal and pupal stages averaging 16·3, 2·2 and 8·8 days, respectively; the pupae were slightly smaller than those collected from cotton bolls, but oviposition records indicated that the females would produce more eggs than field-collected moths. Records for several thousand insects showed that an average of 81·5 per cent. of the larvae originally placed on the medium would give rise to adults.

Artificial diets with purified casein, raw cottonseed meal and a special processed cottonseed meal as their respective basic ingredients were tested as rearing media for *P. gossypiella*. The larvae were reared in individual glass vials under non-aseptic conditions, and a mixture of three antimicrobial agents, butyl paraben, methyl paraben and sorbic acid, was incorporated to prevent contamination by micro-organisms. The larval stage averaged 25·6, 12·9 and 14 days and the pupal weight 13·7, 19·8 and 21·3 mg. on the three diets, respectively; the pupae were smaller than those collected in the field, and females reared from the diet of raw cottonseed meal produced the most and females from the casein diet the fewest eggs. There was little difference among the diets in the percentage of adult emergence, but the first gave the best results, with about 60 per cent. of the larvae giving rise to moths.

Loschiavo (S. R.). **Effects of low doses of ethylene dibromide on some stages of the confused flour beetle,** *Tribolium confusum*.—*J. econ. Ent.* **53** no. 5 pp. 762–767, 3 figs., 17 refs. Menasha, Wis., 1960.

In laboratory tests in Manitoba, in which adults of *Tribolium confusum* Duv. were exposed to low doses of 1, 1·5 or 2 mg. ethylene dibromide per litre for five hours at 27°C. [80·6°F.] and then transferred to a culture medium, females proved more susceptible than males and the survivors laid few eggs during the next ten days, whether mated with treated or untreated males. The percentage of eggs that hatched was reduced when both parents had been treated with 1·5–2 mg. per l., but viable eggs gave rise to larvae that developed normally. Eggs were fumigated similarly, and those treated when four days old failed to hatch, whereas day-old eggs were unaffected by 0·5 mg. but were reduced in viability by 1 mg. ethylene dibromide per l.; development after hatching was normal. Fumigation of pupae with 0·5–2 mg. per l. showed that susceptiblity increased with age and was greater for females than for males; many showed abnormal darkening of the cuticle and abnormal development at emergence. There was no evidence of a strain of *T. confusum* resistant to the fumigant.

Carlson (E. C.). **New insecticides for** *Lygus* **bug control on vegetable seed crops.**—*J. econ. Ent.* **53** no. 5 pp. 767–771, 5 refs. Menasha, Wis., 1960.

The following is based on the author's abstract. DDT, ethion, trichlorphon (Dylox), Thiodan, Trithion and Di-Syston (O,O-diethyl S-2-(ethylthio)ethyl

phosphorodithioate) were tested alone and in combination for the control of *Lygus hesperus* Knight on seed crops of table beet and carrot in California in 1959. The natural population in small plots was augmented by three introductions, resulting in populations of up to 23·5 bugs per plant during the tests.

The materials were applied to beet at 1 lb. per acre in single sprays unless otherwise stated. Treatment with a combination of DDT and trichlorphon was the most effective, giving 78 per cent. control for 28 days, but Thiodan with trichlorphon was almost as good. Five applications of 2 lb. Di-Syston in sprays and of 10 per cent. DDT with 4 per cent. Trithion in dusts, and single sprays of DDT, alone or with Trithion, gave 56–62 per cent. control, and Thiodan and ethion, alone or together, were the least effective. DDT with trichlorphon, and all treatments containing Thiodan, were appreciably more toxic than other materials to the predator, *Orius tristicolor* (White); DDT with trichlorphon had no perceptible effect on *Hippodamia* spp., but five applications of Di-Syston or one of ethion drastically reduced their numbers. Five applications of the dust of DDT and Trithion resulted in a significant increase in numbers of aphids and *Hippodamia*, and five of Di-Syston spray in a significant reduction in the number of plants infected by beet mosaic and the degree of infection. The best treatments against *Lygus* also increased the average size and viability of the seed, and all but Thiodan with Trithion increased the average yield of seed per plant.

Of dusts applied twice by air to carrot, one containing 10 per cent. DDT with 5 per cent. trichlorphon was the most effective against *Lygus*, followed in order by 3 per cent. Thiodan, 10 per cent. DDT with 2 per cent. Trithion and 10 per cent. DDT alone. The yield of seed was significantly increased in third-stage heads by all treatments, but most by DDT with Trithion, and in fourth-stage heads by this mixture and DDT with trichlorphon, the only treatment that gave very significant increases in the size of seeds threshed from heads of these stages. There were no significant increases in the weight or yield of seeds from first- or second-stage heads.

Kirk (R. E.) & Wilson (M. C.). **The effect of soil type and moisture on germination and growth from wheat seed treated with phorate.**—*J. econ. Ent.* **53** no. 5 pp. 771–774, 10 refs. Menasha, Wis., 1960.

The following is substantially the authors' abstract. Greenhouse tests showed that six different soils collected in Indiana and Illinois and different soil moisture levels had very significant effects on the germination and early growth of wheat from seed treated with phorate. Seed viability was adversely affected by excess moisture, regardless of treatment, and although germination was only slightly impaired under conditions of minimum moisture, plant growth was severely reduced. It was found that soils and moisture levels may interact in their effect on seed viability, several of the interactions being highly significant. With minimum watering, relatively high germination and yield were obtained in a muck soil and low germination and yield in a clay silt-loam. With excess moisture, germination was low in both soils. Untreated seed showed low viability in muck soil, probably owing to soil micro-organisms, since germination was substantially improved by the addition of a fungicide. Germination of seed treated with phorate at the highest rate (0·5 lb. per 100 lb. seed) was relatively high in the two most fertile soils, which suggests an apparent binding of the insecticide by the organic matter in the soil. In general, phorate-treated seed was less viable in soils with a low water-holding capacity and with moisture factors that tended to delay germination, whether due to low or to excessive amounts of water.

Cox (J. A.), Van Geluwe (J.) & Lawatsch (D.). **Hexachlorocyclopentadiene, a promising new insecticide for the control of the root form of the grape** *Phylloxera*.—*J. econ. Ent.* **53** no. 5 pp. 788–791, 2 figs. Menasha, Wis., 1960.

The following is based on the authors' abstract. In greenhouse and field tests on the control of *Phylloxera vitifoliae* (Fitch) on the roots of Concord vines in 1956–58, hexachlorocyclopentadiene proved to be an effective fumigant at dosages of 150–200 lb. per acre when applied in solution with a hand injector to depths of 3–6 in., up to 7–10 in. from the roots, or in an emulsifiable mixture as a drench to the surface of the soil. It caused no apparent injury to the roots at 300 lb. per acre.

Bull (D. L.) & Adkisson (P. L.). **Certain factors influencing diapause in the pink bollworm,** *Pectinophora gossypiella*.—*J. econ. Ent.* **53** no. 5 pp. 793–798, 1 fig., 8 refs. Menasha, Wis., 1960.

The following is substantially the authors' abstract. Larvae of *Pectinophora gossypiella* (Saund.), reared on certain artificial diets [*R.A.E.*, A **49** 407], were exposed to various environmental conditions in the laboratory in order to study their influence on the incidence of diapause. Regardless of the diet, exposure to temperatures of 70°F. or lower was enough to cause diapause in a large proportion of the larvae tested; the longer the exposure period, the higher the proportion of larvae in diapause. A high incidence of diapause occurred when larvae reared on cottonseed-meal diets were exposed to either short or abnormally long days, but none occurred in those exposed to a typically long day of 14 hours of light. More larvae entered diapause when these diets contained 5 per cent. oil than when they contained only 1 per cent. No response to photoperiod was shown by larvae reared on a wheat-germ medium. The results indicate a probable relation between photoperiod and diet [*cf. R.A.E.*, A **26** 83] as factors inducing the diapause. Low relative humidity was found to favour the occurrence of diapause in larvae reared on the cottonseed-meal but not the wheat-germ diets.

Ortman (E. E.) & Painter (R. H.). **Quantitative measurements of damage by the greenbug,** *Toxoptera graminum*, **to four wheat varieties.**—*J. econ. Ent.* **53** no. 5 pp. 798–802, 1 fig., 6 refs. Menasha, Wis., 1960.

Preliminary tests in Kansas indicated that heavy infestation of wheat plants by *Toxoptera graminum* (Rond.) caused a marked reduction in root development, and further investigations in which single two-leaf plants of four varieties were infested with 2–10 aphids each and the latter were allowed to feed and reproduce for seven days, showed that, in general, dry root weight, dry leaf weight and leaf growth decreased and the final aphid population increased as the initial number of aphids was increased. The progeny of two parental aphids caused significant reductions in the root and leaf weight of the varieties Ponca and Pawnee and in the leaf growth of the latter; they reduced the leaf weight and growth of Bison, whereas the maximum initial infestation did not significantly affect root weight in this variety. Dickinson, the only spring wheat, showed significant reduction in root weight with four parental aphids and in leaf growth and weight with six and ten, respectively. The results indicated that root systems and aerial parts were about equally damaged; the maximum losses of root weight were 53, 55, 32 and 44 per cent., respectively, for the four varieties.

Specht (H. B.) & Dondale (C. D.). **Spider populations in New Jersey apple orchards.**—*J. econ. Ent.* **53** no. 5 pp. 810–814, 16 refs. Menasha, Wis., 1960.

As spiders may be important natural enemies of injurious arthropods in apple orchards, investigations on their numbers and behaviour were made in New Jersey in 1957. The following is based on the authors' summary of the work. Spiders were more numerous and formed a higher proportion of the total of predatory arthropods in unsprayed than in sprayed orchards. Those that hunt their prey appeared to be more affected by sprays than were the web-builders. The 34 species found are listed, with notes on their abundance; there was a seasonal trend in population density, and eight species comprised about 87 and 58 per cent. of the population in unsprayed and sprayed orchards, respectively, in July–October.

Ratcliffe (R. H.), Ditman (L. P.) & Young (J. R.). **Field experiments on the insecticidal control of insects attacking peas, snap and lima beans.**—*J. econ. Ent.* **53** no. 5 pp. 818–820, 4 refs. Menasha, Wis., 1960.

In tests in Maryland, 1 lb. Methyl Trithion (O,O-dimethyl S-p-chlorophenylthiomethyl phosphorodithioate), 0·75 lb. Thiodan and 0·25 lb. dimethoate or phosphamidon, applied to peas in 25 U.S. gal. emulsion spray per acre on 4th June, caused considerable reductions in populations of *Macrosiphum pisum* (Harris), and 0·25 lb. dimethoate, 1 lb. Dibrom (dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate) and 0·5 lb. Dilan [a 1:2 mixture of Prolan and Bulan], phosphamidon or ethion were very effective in similar applications made on 30th June and 17th July against *Empoasca fabae* (Harris) on early snap beans, dimethoate giving the best results. On late snap beans, treated once on 22nd September, and late lima beans, treated five times between 26th August and 2nd October, 1 lb. wettable or flowable Sevin or emulsifiable DDT in 25 U.S. gal. spray per acre gave 95–100 per cent. control of *Heliothis zea* (Boddie); 1 lb. Thiodan was rather less effective and other materials tested much less so. None of the treatments impaired the flavour of either peas or beans.

Luckmann (W. H.) & Decker (G. C.). **A 5-year report of observations in the Japanese beetle control area at Sheldon, Illinois.**—*J. econ. Ent.* **53** no. 5 pp. 821–827, 1 fig., 3 refs. Menasha, Wis., 1960.

The following is based largely on the authors' abstract. A large population of *Popillia japonica* Newm. was found near Sheldon, Illinois, in 1953, and dieldrin was broadcast for control of the larvae in 1954–58, during which period over 17,844 acres of farmland were treated at a rate of 2–3 lb. toxicant per acre [*cf. R.A.E.*, A **49** 366]. A single application gave excellent control for at least three years, and many other insects that came into occasional or frequent contact with the treated soil were controlled for up to five years; populations of a few injurious insects increased after treatment, but not enough to warrant additional control measures. A few predators were adversely affected or eliminated, but most predators and parasites appeared to be unharmed; the treatment did not eliminate earthworms. Livestock confined to land treated with 20–30 lb. 10 per cent. dieldrin granules per acre by aeroplane showed no ill effects, but poisoning and death occurred in animals, particularly sheep, exposed to drift from aerial sprays of 3 lb. dieldrin per acre. The size of the residues on forage treated with granules depended to a considerable extent on the condition of the plants at the time of treatment.

Metcalf (R. L.), Fukuto (T. R.) & Winton (M. Y.). **Alkoxyphenyl N-methylcarbamates as insecticides.**—*J. econ. Ent.* **53** no. 5 pp. 828–832, 21 refs. Menasha, Wis., 1960.

The authors give a table showing the properties of 24 alkoxyphenyl N-methylcarbamates and the results of investigations in which their insecticidal and anticholinesterase effects were compared with those of Sevin and m-isopropylphenyl N-methylcarbamate. It was found that the last was extremely toxic to larvae of *Estigmene acraea* (Dru.) and *Culex pipiens fatigans* Wied. (*quinquefasciatus*, auct.), but only moderately so to adults of *Musca domestica* L., and that Sevin was somewhat less active against the first two and of low toxicity to the third. The o-ethoxy-, o-isopropoxy- and m-ethoxyphenyl N-methylcarbamates were surprisingly toxic to *M. domestica*, and the 2,5- and 3,5-dimethoxyphenyl compounds much more so and better than malathion, but only the last four of these and 3,4-methylenedioxyphenyl N-methylcarbamate approached the activity of the m-isopropylphenyl compound against *E. acraea* and none was as active against *Culex* larvae. In tests of the residues against adult females of *Panonychus citri* (McG.), only the m-methoxy-, o-n-propoxy-, o-isopropoxy- and o-n-butoxy- compounds showed appreciable toxicity.

Tests on the correlation of structure and inhibition of fly-brain cholinesterase with insecticidal effect showed some very complex relationships. In general, the compounds with most anticholinesterase effect, such as the m-ethoxy-, o-n-propoxy-, o-isopropoxy-, 3,5-dimethoxy- and 3,4,5-trimethoxyphenyl N-methylcarbamates, were very toxic to insects, but tests on synergism showed that the rate of detoxication in the insect body varies greatly with the position and nature of the substituents and that toxicity is directly associated with this factor. Piperonyl butoxide was added to five of the carbamates in a synergist : insecticide ratio of 5 : 1 and showed marked synergistic effect on all of them in tests against *M. domestica* [*cf. R.A.E.*, A **48** 507]. The degree of synergism was inversely correlated with the innate toxicity of the compound, the effect of the weakest and strongest, 3,4-dimethoxy- and 3,5-dimethoxyphenyl N-methylcarbamates, respectively, being multiplied by 33 and 2·5. This result has important implications in judging the relation of structure to activity in carbamates. Though most of those studied showed a fairly narrow range of anticholinesterase effect and would therefore be expected to have reasonably comparable toxicities to *M. domestica*, the LD50's ranged from 11 to more than 500 μg. per g. body weight. There thus appears to be no pronounced correlation between enzyme-inhibition and toxicity until the latter is measured in the presence of a synergist. It seems likely that the synergist acts by inhibiting detoxication mechanisms, which are probably relatively non-specific esterase systems that degrade the toxic compounds before they reach the site of action.

It is reported in conclusion that 2-isopropoxy-5-methoxyphenyl N-methylcarbamate was recently prepared and found to be much more toxic to *M. domestica* than the 3,5-dimethoxyphenyl compound, the most effective of those dealt with in this paper.

Muns (R. P.), Stone (M. W.) & Foley (F.). **Residues in vegetable crops following soil applications of insecticides.**—*J. econ. Ent.* **53** no. 5 pp. 832–834, 9 refs. Menasha, Wis., 1960.

The following is based on the authors' abstract of this account of tests in California in 1957–58, in which insecticides were applied to the soil surface in 100 U.S. gal. emulsion spray per acre and immediately disked in to a depth

of 6–7 in., 2–49 days before sowing. Of 15 vegetable crops grown in soil treated with 10 lb. chlordane per acre, only sweet potato, carrot and swede (rutabaga) had residues of more than 0·3 part per million. Of 12 grown in soil treated with 20 lb. DDT per acre, only potato, bell pepper [*Capsicum*] and table beet contained residues; beets and potatoes contained 0·5 p.p.m., and bell pepper 0·2 p.p.m. Of eight crops grown in soil treated with 42 lb. ethylene dibromide per acre, table beet, onion, turnip, sugar-beet and lima-bean straw showed residues of 9–76 p.p.m. Radishes grown in soil treated with 4 lb. aldrin per acre contained no aldrin but 0·24 p.p.m. dieldrin; no residue was detected from the same dosage of dieldrin. Sugar-beets and table beets grown in soil treated with 3 lb. toxaphene per acre showed residues of 0·4 p.p.m. or less.

Bacon (O. G.). **Systemic insecticides applied to cut seed pieces and to soil at planting time to control potato insects.**—*J. econ. Ent.* **53** no. 5 pp. 835–839, 7 refs. Menasha, Wis., 1960.

The following is substantially the author's abstract. Field tests of three systemic insecticides, phorate, Di-Syston (O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate) and demeton, for the control of insects attacking potato, were made in California in 1957–58.

Treating the cut seed pieces with 44 per cent. phorate or 50 per cent. Di-Syston on activated charcoal at 2·6 oz. powder per 100 lb. gave good control of *Myzus persicae* (Sulz.) on the resulting plants for 77 days, and applications of these compounds in the planting furrow as 2 per cent. granules at 100 lb. per acre controlled the aphid for 86 days; Di-Syston was generally effective for longer than phorate. Demeton, applied to the seed pieces, gave poor control, but was more effective in an emulsion dip than on activated charcoal. Phorate and Di-Syston both gave excellent control of *Empoasca filamenta* DeLong for 97–100 days when applied in granules, but were less effective in the seed treatment; demeton gave no control. Against *Epitrix hirtipennis* (Melsh.), phorate was rather more effective than Di-Syston, and seed-piece treatment than granular application.

Charcoal formulations of phorate and Di-Syston, especially at the rate of 2·6 oz. per 100 lb. seed, greatly retarded plant emergence and sometimes reduced the stand; injury was especially severe in peat soil. Granules had less effect in delaying plant emergence, but caused some slight reductions in stand when applied in the furrow; when placed in fertiliser bands away from the seed pieces, they had little or no effect on plant emergence or growth. Treating the seed pieces with demeton in powder or emulsion form appeared to stimulate plant growth. Applications of phorate to seed pieces or to the soil at planting time left no detectable residues on the tubers 74 or 91 days later.

Johnson (W. T.). **Studies with several systemic insecticides for the control of azalea lace bugs.**—*J. econ. Ent.* **53** no. 5 pp. 839–841, 3 refs. Menasha, Wis., 1960.

Stephanitis pyrioides Scott is the most important insect pest of azaleas in Maryland. In experiments on its control, emulsion sprays of Di-Syston (O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate), phorate and demeton, applied to the upper leaf surfaces in August 1958, gave excellent results, but were less effective than Di-Syston or phorate granules, broadcast on the soil, which completely controlled the Tingid for more than 60 days when

used once at 0·016 and 0·025 oz. active ingredient per plant, respectively [*cf. R.A.E.*, A **48** 468]. Phorate gave complete control within two days, apparently acting as a fumigant. In 1959, 2 per cent. phorate granules, worked into the top 5–6 in. of soil at 4–9 lb. toxicant per acre on the day before azalea cuttings were transplanted into the beds, gave no control of *S. pyrioides* 15 days later, indicating lack of systemic effect. Dimethoate, broadcast at 1 lb. 8 per cent. granules per 100 sq. ft. round heavily infested plants in May eliminated the bugs until late September, apparently controlling the first and second generations. None of the treatments showed any phytotoxic effects.

Henneberry (T. J.), Taylor (E. A.), Smith (F. F.) & Boswell (A. L.). **Comparative acaricidal activity of Tedion, ovex, and chlorbenside against two strains of the two-spotted spider mite.**—*J. econ. Ent.* **53** no. 5 pp. 841–843, 2 graphs, 7 refs. Menasha, Wis., 1960.

In laboratory tests in 1958, acaricides were compared against two strains of *Tetranychus telarius* (L.), one resistant and the other susceptible to organophosphorus compounds. Lima-bean plants were trimmed of all but the two primary leaves dipped in mixtures of 2 lb. 25 per cent. Tedion, 1 lb. 50 per cent. chlorfenson (ovex) or 2 lb. 20 per cent. chlorbenside wettable powders per 100 U.S. gal. water. Female mites were put on the leaves before treatment and removed as soon as the residues were dry or 24 hours later or put on treated leaves and left for 24 hours at various intervals after treatment, after which they were transferred to untreated plants. None of the treatments affected oviposition, but most of the eggs laid on untreated foliage by females treated with Tedion, though apparently healthy, died, whereas few of the eggs or larvae from those treated with the other compounds were affected. Tedion residues were very toxic to the eggs and larvae of both strains when the treated females fed and oviposited on treated leaves, and chlorfenson caused high mortality of eggs of either strain immediately after treatment. Eggs deposited by untreated females of both strains on treated foliage suffered heavy mortality from Tedion residues for 28 days, but were little affected by chlorfenson or chlorbenside; chlorfenson maintained a high larvicidal efficiency against both strains for 14 days, after which the effect decreased much more rapidly for resistant than for susceptible mites, and chlorbenside showed similar but inferior results.

Tsao (C. H.) & Lowry (W. L.). **Factors affecting the tolerance of boll weevils to calcium arsenates.**—*J. econ. Ent.* **53** no. 5 pp. 844–847, 2 graphs, 15 refs. Menasha, Wis., 1960.

The following is based on the authors' abstract. Laboratory tests in Texas showed that adults of *Anthonomus grandis* Boh. that emerged from cotton bolls had a greater wet weight and fat content and were less easily killed by tricalcium arsenate dusts than those that emerged from squares. When field-collected weevils were exposed to commercial calcium arsenate in petri dishes with or without cotton squares for food, those with a lower body weight and fat content died first. Tricalcium arsenate and commercial calcium arsenate killed the weevils even when ingestion was prevented by sealing the mouth-parts, but were only half as effective as against normal insects. Weevils treated with calcium arsenates lost weight more rapidly when subjected to desiccation than did untreated living or dead weevils, and commercial calcium arsenate and tricalcium arsenate caused more rapid

dehydration and were more toxic than mono- or dicalcium arsenate. The mortality of treated insects decreased as humidity increased, whereas that of untreated insects showed little difference. It is concluded that, under field conditions, where the evaporation rate is higher than in the laboratory, the desiccating action of calcium arsenate may be responsible for partial control of the insects.

Boyd jr. (N. R.) & Arthur (B. W.). **Biological degradation of O,O-diethyl O-naphthalimido phosphorothioate (Bayer 22408).**—*J. econ. Ent.* **53** no. 5 pp. 848–853, 3 graphs, 18 refs. Menasha, Wis., 1960.

In laboratory tests in which Bayer 22408 (O,O-diethyl O-naphthalimido phosphorothioate) labelled with ^{32}P was applied orally, dermally or subcutaneously to rats, topically to *Anthonomus grandis* Boh., *Musca domestica* L., *Heliothis zea* (Boddie), *Blattella germanica* (L.) and *Peridroma saucia* Hb. (*margaritosa* (Haw.)) and in sprays to cotton plants, the same group of metabolites, comprising the oxygen analogue (diethyl naphthalimido phosphate (Bayer 25820)), the ethyl phosphoric, diethyl phosphoric and O,O-diethyl phosphorothioic acids and at least three other compounds, was isolated from the three types of biological systems, but in very different proportions.

Rats degraded most of the Bayer 22408 rapidly to water-soluble phosphoric acids, which were eliminated primarily in the urine, but some escaped degradation and was eliminated intact in the faeces. The compound was stable in insects, and most of the absorbed material was recovered as administered, but the oxygen analogue was formed in small amounts by all insects and more readily by *M. domestica* and *B. germanica*, and unidentified fractions were recovered from some. Most of the original compound was recovered unchanged from the leaves of cotton three days after treatment with 2 lb. technical material per acre, with some formation of the oxygen analogue, but when 25 mg. radioactive Bayer 22408 in water emulsion was applied at the base of each plant with a hypodermic syringe, there was practically no translocation to the leaves.

Hamilton (E. W.) & Dahm (P. A.). **A versatile automatic microapplicator.**—*J. econ. Ent.* **53** no. 5 pp. 853–856, 3 figs., 5 refs. Menasha, Wis., 1960.

The following is based on the authors' abstract. Details are given of the construction and operation of an automatic microapplicator, suitable for administering either topical or injected doses of toxic solutions or suspensions. A time delay relay controls the delivery of a wide choice of volumes, ranging from about 0·5 to 5 μl., with a tolerance of 5 per cent. or less, using a 0·25-ml. glass syringe and a 27-gauge hypodermic needle. It was used to make topical applications of acetone solutions of insecticide to the mesonotum of *Musca domestica* L. at the rate of 800 or more flies a day.

Taschenberg (E. F.), Parsons (G. M.) & Moorefield (H. H.). **Performance of Sevin against grape berry moth.**—*J. econ. Ent.* **53** no. 5 pp. 856–859, 1 graph, 7 refs. Menasha, Wis., 1960.

In view of the objectionable residues sometimes left on grapes by DDT sprays applied against *Paralobesia viteana* (Clem.) in New York [*cf. R.A.E.*,

A **49** 239, etc.], Sevin was tested in 1957–59. It was found to be as effective as the standard treatment of 1·5 lb. 50 per cent. wettable DDT per 100 U.S. gal. when used at 2 lb. 50 per cent. wettable powder, but rather less effective at 1 lb. Tests of anti-cholinesterase activity showed that it was compatible with several fungicidal copper compounds of low solubility and with Phaltan (N-trichloromethylthiophthalimide), but not with copper fungicide mixtures containing hydrated lime, which completely hydrolysed it within 60 minutes; this was confirmed by poor control in spray tests. Deposits of 9–12·8 parts Sevin per million were found on the surface of grapes immediately after the last of three applications of 2 lb. Sevin per 100 U.S. gal. or after two applications of DDT and one of Sevin; these were reduced by 32–40 per cent. in one week and by 85–89 per cent. in four. The amounts found in the juice were similar to those on the fresh fruit.

Polivka (J. B.). **Grub population in turf varies with pH levels in Ohio soils.**—*J. econ. Ent.* **53** no. 5 pp. 860–863, 6 figs., 5 refs. Menasha, Wis., 1960.

The following is substantially the author's abstract. A survey of turf grubs and soil acidity, carried out in turf areas throughout Ohio in 1954–58, indicated that *Popillia japonica* Newm. increases in numbers most rapidly in soils of low pH [*cf. R.A.E.*, A **49** 307] and that a high population persists in such soils for as long as favourable weather prevails during the egg and early larval stages. Similar behaviour is indicated for the larvae of *Cyclocephala borealis* Arr., whereas those of *Lachnosterna* (*Phyllophaga*) spp. seemed to reach their maximum numbers at about pH 6.

Wilcoxson (R. D.) & Peterson (A. G.). **Resistance of Dollard red clover to the pea aphid,** *Macrosiphum pisi.*—*J. econ. Ent.* **53** no. 5 pp. 863–865, 13 refs. Menasha, Wis., 1960.

The following is substantially the authors' abstract. In greenhouse tests, plants of the Dollard variety of red clover (*Trifolium pratense*) were more resistant than those of the Wegener variety to *Macrosiphum pisum* (Harris), owing to non-preference and antibiosis [*cf. R.A.E.*, A **45** 352]. This resistance to the aphid appeared to explain a much lower observed incidence of virus in Dollard than in Wegener when these varieties were grown under field conditions at St. Paul, Minnesota, as they were equally susceptible when inoculated mechanically with the mosaic and pea-stunt viruses. Breeding red clover for resistance to aphids may, therefore, be a more successful approach to virus control than trying to breed for resistance to the diseases.

Newton (R. C.) & Graham (J. H.). **Incidence of root-feeding weevils, root rot, internal breakdown, and virus and their effect on longevity of red clover.**—*J. econ. Ent.* **53** no. 5 pp. 865–867, 10 refs. Menasha, Wis., 1960.

Most stands of red clover [*Trifolium pratense*] in the north-eastern United States decline rapidly during their second year, and few of the plants survive a second winter. In order to determine the factors responsible for mortality, plant samples were dug weekly in 1958 and 1959 from a field sown on 25th

April, 1958 in Pennsylvania and examined for root size and insect and other injury. The results showed that damage due to three root-feeding weevils, *Sitona hispidulus* (F.), *Hylastes* (*Hylastinus*) *obscurus* (Marsham) and *Calomycterus setarius* Roel., internal breakdown and associated and independent root rot are the major factors in the lack of persistence of red clover; any one of them may seriously limit the life of a stand, but the interaction between weevil injury and rot increased their destructiveness and probably contributed to arrested plant growth, observed in June 1959, and to the death of two-thirds of the plants by the end of October 1959. The percentage of plants infected with virus increased from 12 in September 1958 to 43 in April–July 1959.

Bacon (O. G.). **Control of the potato tuberworm in potatoes.**—*J. econ. Ent.* **53** no. 5 pp. 868–871, 8 refs. Menasha, Wis., 1960.

The following is substantially the author's abstract. In California, *Gnorimoschema operculella* (Zell.) is particularly difficult to control on varieties of potato, such as Kennebec, which produce tubers close to the soil surface. Insecticides are applied to control populations on the foliage during the growing period, so that fewer moths and larvae will be present to infest the tubers when the crop matures, and tests were carried out to ascertain the best for the purpose. Five applications at intervals of a fortnight were made in 1958, and six at intervals of ten days in 1959. In emulsion sprays, endrin and azinphos-methyl (Guthion) gave excellent results and were the most effective materials tested; 0·75 lb. azinphos-methyl appeared better than 0·6 lb. endrin per acre in killing larvae in the leaf-mines and in controlling adults. Thiodan at 1 lb. per acre gave excellent results in 1958, but poor control of larvae in the foliage in 1959. Sevin at 1·5 lb. per acre was about as effective as 0·6 lb. endrin. Dimethoate at 1 lb. per acre gave only fair control of larvae in the foliage, and 2 lb. DDT had little effect on them. A calcium-arsenate dust was useless.

Although endrin and azinphos-methyl gave almost complete control on the foliage, they afforded only 51 per cent. reduction of infestation in the tubers of the Kennebec variety, as compared with 81 and 75 per cent. in Russett, a deeper-setting variety; these tuber infestations apparently resulted from flights of moths from heavily infested areas nearby. Populations of *Macrosiphum euphorbiae* (Thos.) (*solanifolii* (Ashm.)) were 6 and 12 times as great on plants sprayed with DDT and azinphos-methyl, respectively, in 1958 and those of *Myzus persicae* (Sulz.) 7 and 20 times as great on those treated with azinphos-methyl and Sevin, respectively, in 1959 as on untreated plants.

Getzin (L. W.). **Selective insecticides for vegetable leaf-miner control and parasite survival.**—*J. econ. Ent.* **53** no. 5 pp. 872–875, 10 refs. Menasha, Wis., 1960.

Liriomyza munda Frick [*cf. R.A.E.*, A **45** 480] is an important pest of cantaloup melons and peppers [*Capsicum*] in the Lower Rio Grande Valley of Texas, and several phosphorus insecticides were tested on either plant in 1958–59 for their ability to control the leaf-miner without destroying its parasite, *Derostenus varipes* Crwf. The following is based on the author's summary of the results. Ethion, Delnav (2,3-p-dioxane S,S-bis(O,O-diethyl phosphorodithioate)) and dimethoate in emulsion sprays gave excellent

control of *L. munda*, with residual toxicity for nine days or more on treated foliage; parathion and diazinon were also effective, but lacked residual effect. Delnav was least harmful to the parasite, and parathion, ethion and diazinon were very toxic to it. The best results were obtained with Delnav and dimethoate, which gave lasting control of *L. munda* and permitted 45–100 per cent. survival of the parasite larvae and pupae within the leaf when applied at about 0·5 lb. per acre.

Ortman (E. E.), Sorensen (E. L.), Painter (R. H.), Harvey (T. L.) & Hackerott (H. L.). **Selection and evaluation of pea aphid-resistant alfalfa plants.**—*J. econ. Ent.* **53** no. 5 pp. 881–887, 3 figs., 17 refs. Menasha, Wis., 1960.

The authors describe the methods used in Kansas to select and evaluate lucerne plants in various stages of growth for their resistance to *Macrosiphum pisum* (Harris). Resistant plants were distinguished in the early cotyledon stage by shaking large numbers of aphids over them and selecting the vigorous surviving seedlings; in the late seedling stage by infesting them heavily and examining the aphid colonies on them after 1–2 weeks or determining the degree of stunting of the plants after two months; and in mature plants by aphid counts and observations of stunting in the presence of a heavy natural infestation in the field or in greenhouse tests. The results obtained are discussed; they were in general agreement, which indicates the validity of the different techniques used, but it is concluded that greenhouse testing and evaluation in the seedling stage are preferable to tests with natural field infestations.

Daum (R. J.) & Dewey (J. E.). **Designing orchard experiments for European red mite control.**—*J. econ. Ent.* **53** no. 5 pp. 892–898, 3 graphs, 34 refs. Menasha, Wis., 1960.

The following is based on the authors' abstract. The desirability of preventing damage by *Panonychus ulmi* (Koch) rather than eradicating the mite after damage has been observed has created a need for satisfactory experimental designs for the evaluation of acaricides under orchard conditions and statistical summarisation and interpretation of the results. The literature on the sampling of mite populations is briefly reviewed, and two experiments on the prevention of damage and one on eradication in apple orchards in New York are presented as examples, with statistical treatment and interpretation of results. Data obtained from counts made periodically during the season were analysed statistically as split-block designs; before analysis of variance could be conducted, a logarithmic transformation was necessary to remove the proportional relationship between the means and the standard deviations to meet the requirements of an F test. Increasing the number of trees gave a greater gain in detecting treatment differences than increasing the number of leaves sampled or the number of sampling dates. In an experiment using mild acaricides in a general preventive spray schedule, the addition of chlorfenson (ovex) to each application of a mixture of DDT and parathion significantly improved control of *P. ulmi*, and so did replacing captan by glyodin as the fungicide. A tank mixture of DDT and diazinon was as effective as most formulations of DDT and parathion. In the other experiments, differences in mite numbers were large in one and small in the other, but not significant in either.

Tarshis (I. B.). **Control of the snake mite** (*Ophionyssus natricis*), **other mites, and certain insects with the sorptive dust, SG 67.**—*J. econ. Ent.* **53** no. 5 pp. 903–908, 14 refs. Menasha, Wis., 1960.

This paper [*cf.* also *R.A.E.*, B **49** 185] includes an account of experiments on the effectiveness of SG 67, which is composed of 95·3 per cent. silica aerogel with 4·7 per cent. ammonium fluosilicate impregnated in less than a continuous mono-molecular film on the internal surfaces of the finely divided compound, against mites of the genus *Tyrophagus* from a culture established on powdered dog biscuits. In one series, the mites were placed in a dish containing 50 mg. SG 67, and in another a similar amount of the aerogel was mixed with 5-ml. samples of the medium containing the mites; in both series, all mites were dead after three hours at all relative humidities. In a further test, mites treated with SG 67 and kept at 77–80°F. and 25 and 50 per cent. relative humidity lost the greatest percentage of weight in the first three hours and appreciably smaller percentages thereafter, but those kept at 75 per cent. relative humidity lost appreciable amounts after 3, 6 and 24 hours, which is attributed to the fact that, at the temperature prevailing, the aerogel absorbs moisture at a relative humidity of 75 per cent. but not at the lower humidities. SG 67 had no effect on the eggs.

Chiang (H. C.) & Holdaway (F. G.). **Relative effectiveness of resistance of field corn to the European corn borer,** *Pyrausta nubilalis*, **in crop protection and in population control.**—*J. econ. Ent.* **53** no. 5 pp. 918–924, 10 refs. Menasha, Wis., 1960.

The following is substantially the authors' abstract. The survival and development of *Ostrinia* (*Pyrausta*) *nubilalis* (Hb.) on ten double-cross hybrid varieties of field maize were studied in southern Minnesota in 1956–58. Five were resistant and five susceptible to infestation by the first generation, and it was found that the average survival and rate of development of this generation were lower on resistant than on susceptible varieties, indicating that plant resistance will reduce the injury caused by the borer. The reactions of each individual variety varied from year to year, so that it was impossible to indicate the most resistant or the most susceptible in their respective groups. The larvae suffered nearly 60 per cent. mortality during the first two hours and nearly 80 per cent. during the first 24 hours of life on either susceptible or resistant plants, and it is proposed that mortality due to plant resistance should be computed on the basis of the population that escapes this initial indiscriminate mortality. The number of larvae present at the beginning of the next annual cycle, in the following spring, was almost identical on resistant and susceptible varieties, indicating that the effects of the differences in survival and development of the first generation were later eliminated, owing to higher infestation by the second generation on plants that had low populations of the first generation and to lower winter mortality on resistant than on susceptible varieties. Infection by *Perezia pyraustae* [*cf. R.A.E.*, A **46** 439] was lower among larvae on resistant plants than among those on susceptible ones, and this may have been responsible for the higher survival of overwintering larvae on resistant plants.

Everly (R. T.). **Loss in corn yield associated with the abundance of the corn leaf aphid, *Rhopalosiphum maidis*, in Indiana.**—*J. econ. Ent.* **53** no. 5 pp. 924–932, 7 figs., 15 refs. Menasha, Wis., 1960.

The following is based on the author's summary. *Aphis* (*Rhopalosiphum*) *maidis* Fitch is a common pest of maize in Indiana, causing occasional damage in widely scattered fields. In 1959, conditions favoured its development, and serious losses occurred in the northern two-thirds of the State. The area of heaviest infestation was a band roughly three counties wide in the north-central part, and the area of greatest damage followed a similar pattern, with up to 40 per cent. loss of yield in many fields.

The yields obtained under these conditions supported previous observations that severe infestation results in barren plants and also increases the number of imperfect ears. In one field, the data indicated that light infestations reduce the yield by as much as 10 per cent., by decreasing the size and weight of the ears, and there was also evidence that commercial hybrid maize varies in degree of infestation and in tolerance of loss due to this insect.

Data from 12 areas surveyed in the autumn indicated a high positive correlation between loss of yield and the percentage of plants infested, and it was possible to estimate the loss in individual fields from this. The relation probably varies from year to year as the interaction of control factors changes, but the possibility of establishing a relation between infestation and loss through the proper evaluation of environmental factors is indicated.

Read (D. C.). **Effect of soil treatments of heptachlor and parathion on predators and parasites of root maggots attacking rutabagas on Prince Edward Island.**—*J. econ. Ent.* **53** no. 5 pp. 932–935, 12 refs. Menasha, Wis., 1960.

As the use of chemicals for the control of *Hylemyia brassicae* (Bch.) attacking swedes in Prince Edward Island [*cf. R.A.E.*, A **49** 350, etc.] has sometimes resulted in increased injury, an experiment was carried out to ascertain whether heptachlor and parathion destroy *Aleochara bilineata* Gylh., *Trybliographa rapae* (Westw.) and predacious Carabids in the soil. Both insecticides give very significant control of *H. brassicae* when applied in a concentrated band below the surface in a ridged row [*cf. loc. cit.*], but were applied at 5 lb. per acre in six-inch bands along both sides of the row in the experiment, so that larvae might survive and provide records of attack by natural enemies. Plants sown on 5th June were treated on 4th August, when adults of the first generation of *H. brassicae* were emerging, and harvested in the last week of October. All plants in treated and untreated plots were severely damaged by the larvae, showing that neither insecticide gave any protection. Heptachlor caused 80 per cent. reduction in the number of pupae attacked by *A. bilineata* and resulted in more than twice as many *Hylemyia* pupae and only a quarter as many examples of the Staphylinid at harvest as no treatment; there was no reduction in numbers of *Hylemyia* in the 4–5 in. of soil round the plants that was free of insecticides. Parathion reduced attack on the pupae by 23 per cent. and caused no apparent reduction in *Hylemyia* population. Periodic examination of the soil in August and September showed rather more dead Carabids and Staphylinids in and near treated rows than near untreated ones. Secondary species such as *H. cilicrura* (Rond.) comprised about 25 per cent. of the puparia collected, and these were attacked to the same degree as *H. brassicae* in treated and untreated plots; the main natural enemy was *A. bilineata*, and parasitism by *T. rapae* was slight.

Floyd (E. H.), Clower (D. F.) & Mason (L. F.). **Effect of sugarcane borer infestation on the yield and grade of corn.**—*J. econ. Ent.* **53** no. 5 pp. 935–937, 1 ref. Menasha, Wis., 1960.

Diatraea saccharalis (F.) is a serious pest in Louisiana, and the damage that it causes to maize was investigated in 1957–59. It was found in 1957–58 that infestation could be controlled for 10–14 days by endrin in granules, and various schedules of application of 2 per cent. granules were compared in a heavily infested area in 1959. Treatment when the plants were 12 in. high did not prevent stalk breakage later in the season, though it possibly prevented total loss of the plants. Treatment when the plants were 18 in. high caused significant reductions in the numbers of stalks broken, and all later treatments resulted in some plants with relatively few damaged internodes and in less severe damage in individual internodes. All treatments reduced borer damage to the primary ears, and all but those made when the plants were 12–18 in. high reduced damage to the secondary ears. The number of primary ears per plant was reduced by *D. saccharalis* and improved by insecticide applications, particularly those made during the early stages of ear development, but the total number of secondary ears was not influenced by control of the borer. The weight of grain per ear and its quality were highest when infestation was kept at the lowest level; the larvae reduced ear size by destroying the kernels as well as by mutilating the stalk and shank and so possibly interfering with the transfer of plant nutrients and water; the effect was less on secondary than on primary ears. Control at any time from the immediate pre-tassel stage to early ear development resulted in increased yields from both standing and broken stalks, whereas treatment at the dough stage did not; all treatments after the 18-in. stage increased the yield from standing plants. It is concluded that attack by *D. saccharalis* reduces the grade and yield of maize; the reduction in yield results from reductions in the number of primary ears containing whole kernels, in ear size and in weight per bushel of grain.

Rudinsky (J. A.), Terriere (L. C.) & Allen (D. G.). **Effectiveness of various formulations of five insecticides on insects infesting Douglas-fir logs.**—*J. econ. Ent.* **53** no. 5 pp. 949–953, 14 refs. Menasha, Wis., 1960.

The following is based on the authors' abstract. The application of 0·2 g. endrin, lindane [almost pure γ BHC] or Thiodan and 0·4 g. heptachlor or Sevin per sq. ft. in sprays to the bark of freshly cut logs of Douglas fir (*Pseudotsuga menziesii*) provided very good protection from infestation by *Dendroctonus pseudotsugae* Hopk. and other bark- and wood-boring beetles in tests in Oregon in 1959; emulsions and solutions were more effective than suspensions. Field bioassays and bark analyses of the treated logs ten weeks after application indicated that much of the insecticide penetrated the bark, particularly when applied in solution or emulsion. Wood-fibre surfaces, treated with emulsions and suspensions of the five insecticides, were used for studying toxicity to the adults under constant laboratory conditions for a period of seven weeks. In wettable powders, Thiodan, endrin and Sevin showed a gradual decline in toxicity and heptachlor and γ BHC a rapid one. The emulsions exhibited parallel trends, but lower toxicity in all cases.

Burts (E. C.) & Kelly (S. G.). **Seed abortion and fruit drop in Bartlett pear caused by Sevin.**—*J. econ. Ent.* **53** no. 5 pp. 956–957. Menasha, Wis., 1960.

In 1959, sprays of 2 lb. 50 per cent. wettable Sevin per 100 U.S. gal., applied to Bartlett pears at Wenatchee, Washington, on 11th May (21 days after full bloom), 2nd June and 17th July, caused a much higher drop of fruit just before harvest than did three other insecticides. As Bartlett pears sometimes develop with few or no seeds in this area, and such fruits tend to drop just before harvest, counts were made to determine whether the excessive drop of fruits in the plots sprayed with Sevin was associated with reductions in the numbers of seeds. It was found that Sevin reduced the number of seeds per fruit and increased the percentage of seedless fruits, though fruits on trees in other plots also had a low seed count and tended to drop.

Wene (G. P.) & Sheets (L. W.). **A fungus disease of the salt-marsh caterpillar in Arizona.**—*J. econ. Ent.* **53** no. 5 p. 957, 1 ref. Menasha, Wis., 1960.

Estigmene acraea (Dru.) was attacked by *Entomophthora aulicae* on cotton in the Salt River Valley of Arizona in September and October 1958, when the weather was unusually humid for that area. The larvae were abundant in September, though a few that had been killed by the fungus were found on heavily infested cotton, but a more severe infestation in October was materially reduced by *E. aulicae*, which was found on irrigated cotton shortly after the last September irrigation. There was no evidence that the larvae were affected before they reached the third instar, though feeding by the older larvae was much reduced. In one field, 70 per cent. of the larvae beyond the second instar were killed in October, and in others, practically all the larger larvae were dead, dry and brittle. Control was so effective that insecticides were required in only a few fields, and the usual late-season migration from cotton to vegetables did not occur.

Connola (D. P.). **Control of maple leaf cutter, *Paraclemensia acerifoliella*, by aerial spraying.**—*J. econ. Ent.* **53** no. 5 pp. 957–958, 1 ref. Menasha, Wis., 1960.

Paraclemensia acerifoliella (Fitch) caused serious damage to the foliage of sugar maple (*Acer saccharum*) in northern New York in 1958 and 1959. This Incurvariid is reported from a work already noticed [*R.A.E.*, A **38** 444] to have one generation a year; the adults emerge in May and deposit eggs in the leaf tissues, and the larvae mine the leaves for 10–14 days and then live as case-bearers until late August or September, when they fall to the ground and pupate in their cases. In a test in 1959, spraying with 2 U.S. gal. 9 per cent. DDT in fuel oil per acre from an aeroplane on 22nd–23rd July, when the larvae had ceased mining and before foliage damage was severe, gave good control. Examination on 15th August showed that leaf-cutting activity had not progressed since the treatment in sprayed stands, in which the foliage remained green, but had continued in unsprayed stands, in which the foliage was badly damaged and turning brown.

Newton (R. C.). **The nesting habits of the wasp,** *Solierella* **sp., and the location of its egg on the grasshopper,** *Ageneotettix deorum*.—*J. econ. Ent.* **53** no. 5 pp. 958–959, 1 fig., 4 refs. Menasha, Wis., 1960.

A Sphecid of the genus *Solierella* was observed to provision its burrow with a fourth-instar nymph of *Ageneotettix deorum* (Scud.) on rangeland in Montana in July 1956. Examination of the burrow showed that it contained only the one nymph, with an egg attached behind the left metathoracic coxa and extending ventrally. Comparison with other records indicates that the position of the egg of *Solierella* is consistent on grasshoppers and can serve as an identification in the absence of the adult predator.

Fahey (J. E.), Wilson (M. C.) & Rusk (H. W.). **Persistence of BHC, lindane, and Thiodan residues when applied to alfalfa to control the meadow spittlebug.**—*J. econ. Ent.* **53** no. 5 pp. 960–961, 2 refs. Menasha, Wis., 1960.

BHC, lindane [almost pure γ BHC] and Thiodan at 0·25 lb. per acre have given effective control of *Philaenus leucophthalmus* (L.) on leguminous forage crops in the United States [*cf. R.A.E.*, A **43** 316; **45** 431]. Since there is a possibility that the meat or milk of cattle might be contaminated by feeding on treated plants, the persistence of the residues on lucerne was investigated in Indiana. In 1958, BHC and γ BHC, applied at 0·22 lb. per acre in sprays and BHC at 0·26 lb. in granules on 29th April, when the plants were 15 in. high, left appreciable residues after 24–31 days. In 1959, spraying with 0·3 lb. γ BHC on 29th April, when the plants were 12 in. high, left no appreciable residue at maturity, 20 days later, whereas 0·23 lb. BHC and 0·26 lb. Thiodan left residues of 0·4 parts per million. Similar applications on 16th April, when the plants were 6 in. high, left no measurable residues on the mature lucerne 33 days later. It is concluded that treating lucerne with 0·2 lb. BHC or Thiodan per acre at least 30 days before harvest would give the most practical control of *P. leucophthalmus* without contamination of the forage and that, if treatment must be delayed, γ BHC can safely be applied up to 20 days before harvest.

Hunter (P. E.) & Lund (H. O.). **Biology of the periodical cicada in Georgia.** —*J. econ. Ent.* **53** no. 5 pp. 961–963, 10 refs. Menasha, Wis., 1960.

The authors report that adults of brood XIX of the 13-year cicada, *Magicicada septendecim tredecim* (Ril.), emerged in 14 counties of Georgia between March or April and early May in 1959 [*cf. R.A.E.*, A **22** 256]. The lower branches of trees and bushes were heavily marked with oviposition scars. Examination of small branches of ten species of trees showed a mean of 18·36 eggs per cluster, and statistical analysis of the numbers showed that significantly more eggs per cluster were deposited on box elder (*Acer negundo*) than on six of the others; general observation indicated that more clusters per linear foot were deposited on this species. The eggs hatched if kept in a moist environment, but not if allowed to dry. The adults were of two sizes, of which the smaller comprised 37 per cent. of the total; 64 per cent. of the small form and 48·5 per cent. of the large one were females, and the average of 54·9 per cent. for the two forms showed a significant deviation from a 1:1 ratio. Oviposition and fecundity data are based on the large and small forms considered as a single population, though they may eventually be classed as distinct species.

Harrison (F. P.) & Osgood (C. E.). **Insecticide tests for tobacco flea beetle and green peach aphid control in Maryland tobacco.**—*J. econ. Ent.* **53** no. 5 p. 963, 1 ref. Menasha, Wis., 1960.

In southern Maryland, *Epitrix hirtipennis* (Melsh.) attacks tobacco soon after it is transplanted and *Myzus persicae* (Sulz.) usually most severely late in the growing season, when the plants are large. Tests of soil treatment with insecticides against the flea-beetle did not give significant results, because of the small populations present. Against *M. persicae*, phorate granules were broadcast and watered into the plant bed on 12th June, ten days before transplanting, but counts on 3rd August showed no control. Sprays of 0·5 lb. dimethoate or phosphamidon or 0·75 lb. Thiodan per acre applied to the plants on 4th August, when aphid populations were measurable, were fairly effective and still gave significant control on 17th August, three days before the tobacco was cut; only phosphamidon significantly increased the yield, and none improved the value of the crop.

Keaster (A. J.) & Fairchild (M. L.). **Occurrence and control of sand wireworm in Missouri.**—*J. econ. Ent.* **53** no. 5 pp. 963–964, 5 refs. Menasha, Wis., 1960.

Horistonotus uhleri Horn, which has been observed in light sandy soils in south-eastern Missouri since 1916, damaged maize and other crops in 1955–59. A field of maize sown in May 1959 showed damage by the second week of June, with 3 out of 15 acres severely affected, and there were 3–6 larvae immediately under or feeding on the roots of each wilting plant examined. One acre showing severe injury was disked to destroy the remaining stalks and resown on 19th June, immediately after insecticides had been disked into the soil. Stand counts made in the two middle rows of each plot when the plants were about 3 ft. high and, in brackets, the yields in bushels per acre on 27 September were 209 (56·4), 186 (55) and 202 (51·9) after treatment with 1·2 lb. Am. Cyanamid 18133 (O,O-diethyl O-2-pyrazinyl phosphorothioate) in granules and 1·5 lb. heptachlor and 1·13 lb. Hercules 5727 (m-isopropylphenyl N-methylcarbamate) in emulsion per acre, respectively, as compared with 125 (37·7) on untreated soil. Yield differences were significant between treated and untreated plots, but not between insecticides. Larvae were observed until late August, at depths of 15–20 in. in hot dry weather and within 2–3 in. of the soil surface, feeding on the roots, in cool wet weather.

Munger (F.) & Gilmore (J. E.). **Mass production of the *Citrus* red mite.**—*J. econ. Ent.* **53** no. 5 pp. 964–966, 3 figs., 4 refs. Menasha, Wis., 1960.

The authors describe a method of rearing large numbers of *Panonychus citri* (McG.) in the laboratory, in which mites are allowed to oviposit for about 24 hours on a tray of green lemons and are then blown from these on to another tray of fresh lemons; the eggs are not disturbed, and the ovipositing population is used repeatedly and augmented as needed from laboratory stocks. The lemons bearing eggs are sprayed with water to remove any stray females and débris and kept in a muslin-covered case for development of the mites, fruits that become unattractive through feeding damage or age being replaced when necessary

Bry (R. E.), McDonald (L. L.) & Davis (D. F.). **Preliminary evaluation of lindane and heptachlor crystals for protection of crated furniture against insect damage.**—*J. econ. Ent.* **53** no. 5 pp. 966–967, 2 refs. Menasha, Wis., 1960.

In preliminary tests on the control of *Attagenus megatoma* (F.) (*piceus* (Ol.)) in large wooden crates (174 cu. ft.), such as are used for storing furniture, lindane [almost pure γ BHC] and heptachlor were applied at 5 g. per cu. ft., either loose in four muslin bags at the top corners or affixed to paper [*cf. R.A.E.*, A **48** 390] at 30 and 20 g. per sq. ft., respectively, that was fastened to the ceilings and walls of the crates, and larvae were caged at three levels in them for 14, 28 or 42 days, either immediately after treatment or 42 days later. The crates were stored in an unheated warehouse at temperatures of 34–88°F. After the shortest exposure, both γ BHC and heptachlor caused complete mortality when applied on paper, either immediately or after 42 days, but neither did so when applied in bags. After the two longer exposures, heptachlor in bags gave complete mortality on both occasions, but lindane was considerably less effective.

Still (G. W.). **An improved trap for deciduous tree fruit flies.**—*J. econ. Ent.* **53** no. 5 p. 967, 1 fig. Menasha, Wis., 1960.

A trap consisting of a container holding an attractant and a sticky yellow board supported vertically on its rim proved effective in capturing adults of *Rhagoletis pomonella* (Walsh), *R. cingulata* (Lw.) and *R. fausta* (O.-S.) in Ohio, but allowed the attractant to become diluted, and thus less effective, in wet weather. The author describes an improved model in which the jar is protected with a sheet of metal bolted to the board, with a hole close to the board to allow the attractive odour to escape near the centre as well as at the edges. The hole is covered with a second metal flap, and the angles of the two layers are adjusted to give the maximum diffusion of the lure and protection from rain.

Herne (D. C.). **Combinations of acaricides with complementary activity.**—*J. econ. Ent.* **53** no. 5 pp. 967–968, 2 refs. Menasha, Wis., 1960.

As many acaricides are highly effective only against certain stages in the life-cycle of Tetranychids, pairs that might complement each other and thus destroy all stages were compared with the same materials used alone against a laboratory strain of *Tetranychus telarius* (L.) in the greenhouse in Ontario. The materials tested were Tedion at 0·5 pint 10 per cent. emulsion concentrate, mevinphos (Phosdrin) at 2·5 fl. oz. 100 per cent. emulsion concentrate, azinphos-methyl (Guthion) at 1·25 lb. 25 per cent. wettable powder and Indopol L-100 (polybutene) [*cf. R.A.E.*, A **49** 37] at 1·3 lb. 75 per cent. emulsion concentrate per 100 gal. Sprays were applied to run-off on established populations containing all stages, and Tedion, mevinphos and azinphos-methyl gave poor results when applied alone, though Indopol caused high immediate mortality. The addition of Tedion to the other materials had little effect after two days, though it improved the kill given by azinphos-methyl, but after seven days, when Tedion alone gave only 25 per cent. mortality, it increased the kill given by Indopol, mevinphos and azinphos-methyl from 78, 17 and 40 per cent., respectively, to 100,

96 and 98 per cent. The addition of a specific acaricide to insecticidal phosphates is usually recommended in Ontario only after the mites have become resistant to phosphorus, but these results suggest that the earlier use of such combinations may be desirable to increase effectiveness and delay the development of resistance.

Simmons (P.). **Malathion against lead cable borers.**—*J. econ. Ent.* **53** no. 5 p. 968. Menasha, Wis., 1960.

Adults of the Bostrychid, *Scobicia declivis* (Lec.), which are on the wing in March–July near Fresno, California, are attracted to the products of fermentation that occur in dried fruit, and make circular holes in the laminated paper covers under which stacks of raisins are stored. In laboratory tests, beetles exposed for up to an hour to fresh residues of 47–59 mg. malathion per sq. ft. from a wettable-powder spray were paralysed in 24 hours and dead in 72; deposits two days old killed beetles exposed for 1–5 minutes in 48 hours, but deposits ten days old gave poor kills. Deposits of 59–118 mg. per sq. ft. from emulsion sprays were less effective. When a stack end of about 500 sq. ft. was sprayed with 20 lb. 25 per cent. wettable malathion per 100 U.S. gal., to give a deposit of 80 mg. per sq. ft. on 24th April and 7th and 21st May, counts made at intervals from 27th April to 5th June showed 8 penetrations per sq. ft., as compared with 55 per sq. ft. in an untreated area. When applied to paper-covered stacks with a total area of 20,700 sq. ft. on 3rd July with a power sprayer, to give an estimated deposit of 70 mg. per sq. ft., 3 lb. 25 per cent. wettable malathion per 100 U.S. gal. gave good protection.

Simmons (P.). **Escape of methyl bromide through wallboards.**—*J. econ. Ent.* **53** no. 5 pp. 968–969. Menasha, Wis., 1960.

The author describes tests on the resistance of various proprietary wallboards, with or without the addition of paints, to permeation by methyl bromide and concludes from the results that Masonite Panelwood or its equivalent, with 1–2 coats of an asphalt-aluminium emulsion, is the cheapest satisfactory material unless prices change substantially; unpainted panelwood is not satisfactory, as the amount of methyl bromide retained for 24 hours in a chamber made of it is negligible.

Simmons (P.). **Experiments to exclude *Drosophila* from dried fruit.**—*J. econ. Ent.* **53** no. 5 p. 969. Menasha, Wis., 1960.

In California, some raisins are made by dehydrating the grapes artificially, and methods of preventing infestation by *Drosophila* spp., mainly *D. melanogaster* Mg., which attack the fruit while it is awaiting processing, after picking, were tested. The use of two fans, which directed the air diagonally against the opposite corners of a stack of boxes at a speed of 3–8 miles per hour for 20 hours or more from mid-afternoon, reduced the infestation by 97 per cent. Covering attractive food material with 40-mesh cheesecloth prevented entry by *D. similans* Sturt., but tobacco shade cloth (10 threads per inch), used singly or doubly or dipped in emulsions containing pyrethrum or methoxy-DDT (methoxychlor) before use, permitted entry within 24 hours and heavy infestation within 48.

Simmons (P.). **Malathion sprays for reducing dried-fruit packing house infestations.**—*J. econ. Ent.* **53** no. 5 pp. 969–970. Menasha, Wis., 1960.

The author records the results of spraying several dried-fruit packing plants in California with wettable malathion to protect the packed product from insects migrating from newly received unfumigated fruit. Either treating the wall to a height of 4 ft. and the adjacent floor for a width of 2 ft. with 5 lb. malathion or treating all open floor spaces in September with 3 lb. malathion per 100 U.S. gal. caused an abrupt drop in populations of insects, including *Oryzaephilus surinamensis* (L.), and spraying 4 ft. round the perimeter and for 4 ft. up the wall with 5 lb. malathion per 100 U.S. gal. in August, September and October caused a marked improvement after the first application, but did not prevent invasion by larvae of *Cadra* (*Ephestia*) *figulilella* (Gregson) during the week after the last. Only 96 insects, including *O. surinamensis*, *Carpophilus* spp., *Drosophila* sp., Dermestids, *Tribolium* spp., *C. figulilella* and *Blapstinus* sp., were caught from 5th July to 16th December on the shipping floor of a plant sprayed four times at monthly intervals.

Landi (J.) & DeBach (P.). **A new technique for shipment of natural enemies of insects.**—*J. econ. Ent.* **53** no. 5 pp. 970–971, 1 ref. Menasha, Wis., 1960.

The authors discuss the difficulty of transporting adult parasites by air and describe tests to find improved methods. Adults of *Aphytis* spp. supplied with a gel of orange juice, pectin and granulated cane sugar (125 : 63 : 250), covered with a thin dry layer of wax, through which the parasites fed readily, lived for at least as long as those fed with honey, and adults packed in vacuum flasks survived external freezing temperatures for eight hours and an external temperature of −4°F. for four hours without ill effects. Tests were therefore made in which the flasks were coated inside with the gel in a layer $\frac{1}{16}$–$\frac{1}{8}$ in. thick or partly coated with an agar-type slant up to $\frac{1}{4}$ in. thick and left unsealed for 4–6 days to allow the gel to harden, after which a layer of wax was put over the gel and allowed to harden for a few hours. About 1,400–1,600 adults of *A. lingnanensis* Comp. were transferred to each flask, which was then corked and packed, and half the flasks were sent by air from California to New Jersey and back (about 5,800–6,000 miles) in three days, and half kept at constant temperature in the insectary. Counts of living parasites showed 1,298 and 977 in totally and partly coated flasks after air transport and 1,486 and 1,274 in the others, and it is concluded that the use of vacuum flasks containing thin films of suitable nutriments in gels would ensure the safe transport of many species of beneficial insects. The agar slant became detached and rotated during shipment, producing a sticky surface that trapped many of the insects, and this form is therefore not recommended.

Erdman (H. E.). **Adult longevity as a sensitive criterion of radiation-induced damage when 24-hour *Habrobracon* (Hymenoptera) embryos are X-rayed.**—*J. econ. Ent.* **53** no. 5 pp. 971–972, 15 refs. Menasha, Wis., 1960.

Virgin females of *Bracon hebetor* Say (*Habrobracon juglandis* (Ashm.)) were irradiated as day-old embryos with whole-body X-rays, delivered at 600 r per minute by a 250 Kv generator, and allowed to mature. Their

duration of life fell from more than 23 days for insects receiving 600 r to 16, 14 and 8 days for those receiving 900, 1,200 and 1,500 r, respectively, whereas the percentage that transformed to adults and the percentage of their eggs that hatched were not regularly affected. Insects that received 1,800 r transformed to adults and lived for eight days, but oviposited for only three, and only one of those that received 2,100 r became adult, living for three days and not ovipositing.

Adler (V. E.). **Effects of low temperatures on the eggs of the Angoumois grain moth, the Indian-meal moth and the confused flour beetle.**—*J. econ. Ent.* **53** no. 5 pp. 973–974, 3 graphs. Menasha, Wis., 1960.

When eggs of *Sitotroga cerealella* (Ol.), *Plodia interpunctella* (Hb.) and *Tribolium confusum* Duv. were subjected to low temperatures for 1–8 hours and incubated for 14 days, none hatched after exposure to 2°F. for 4, 4 and 5 hours, respectively, and 65, 52 and 17 per cent. after exposure for one hour. None hatched after exposure to 39°F. for 8, 5 and 6 hours, respectively, and 100, 65 and 47 per cent. after one hour; 96 per cent. of untreated eggs hatched, and it is concluded that the LE50's (lethal exposures permitting 50 per cent. hatch) are 2, 1·6 and much less than one hour at 2°F. and 3·3, 2·5 and 0·9 hours at 39°F.

Speirs (R. D.). **The effectiveness of Sevin-sesamex combinations against adult flour beetles** (*Tribolium* **spp.**).—*J. econ. Ent.* **53** no. 5 p. 974, 1 ref. Menasha, Wis., 1960.

In tests of the direct contact toxicity of Sevin and sesamex, applied in aerosols at various rates, to adults of *Tribolium*, combinations of the two in ratios varying from 1:5 to 5:1 all gave better results than Sevin alone at equivalent rates, and sesamex alone had no effect. Toxicity increased steadily as the proportion of sesamex in the mixtures increased from a quarter to three-quarters, and a deposit of 3·5 mg. Sevin per sq. ft. in a 1:1 mixture was about as effective as 10·4 mg. Sevin alone, and 0·9 mg. in a 1:5 mixture almost as effective as 3·5 mg. alone [*cf. R.A.E.*, B **49** 166].

Simmons (P.). **Responses of raisin moth larvae to residues of six insecticidal sprays.**—*J. econ. Ent.* **53** no. 5 pp. 975–976. Menasha, Wis., 1960.

In storage yards in California, fully grown larvae of *Cadra* (*Ephestia*) *figulilella* (Gregson) sometimes leave newly received, unfumigated raisins and wander in search of pupation sites to stacks of boxes of unprocessed raisins covered with laminated paper, and experiments were therefore carried out in 1954–57 to find sprays that would kill them when applied to the paper covers. When paper was treated to run-off with wettable-powder sprays containing the equivalent of 8·3 lb. malathion per 100 U.S. gal. at 2·3 U.S. gal. per 1,000 sq. ft., larvae exposed for 15 minutes 3–5 days later, 30 minutes 4–7 days later and 45–120 minutes 3 days later all died in 6–8, 5–6 and 4 days, respectively; day-old deposits were slower in action, and those that were 10–11 days old showed marked loss of killing power. Malathion at 4–5 lb. per 100 U.S. gal. had little value, DDT was ineffective, and chlordane and lindane [γ BHC], alone and in mixtures and mixtures of pyrethrins and piperonyl butoxide all gave poor results.

Thurston (R.). **Effect of insecticidal sprays on hornworms and on** *Apanteles congregatus*.—*J. econ. Ent.* **53** no. 5 p. 976. Menasha, Wis., 1960.

In the tests described, DDD (TDE) and endrin, the insecticides most commonly used on tobacco in Kentucky, were applied in emulsion sprays at 10 U.S. gal. per acre on 30th June, 21st July and 11th August, or on the last one or two of these dates. Counts of hornworms, of which more than 95 per cent. were *Protoparce sexta* (Joh.) and the remainder *P. quinquemaculata* (Haw.), on 16th September showed averages of 50, 59 and 95 per cent. control for treatments with 0·2, 0·4 and 0·8 lb. endrin per acre and 82, 83 and 90 per cent. for 1, 2 and 4 lb. DDD, respectively. Parasitism by *Apanteles congregatus* (Say) was greatly affected, averaging 10 per cent. on treated plots and 31 per cent. on untreated ones. Leaves collected on 17th September showed average residues of 1·4, 1·5 and 4·3 parts per million for the three doses of endrin and 27 and 82 p.p.m. from 1 and 2 lb. DDD.

Guevara C. (J.), Patiño (G.) & Casas (E.). **Selección de variedades de frijol resistentes al picudo del ejote.** [Selection of varieties of bean resistant to *Apion godmani*.]—*Agric. tec. Méx.* no. 10 pp. 10–12, 2 figs., 1 ref. Mexico, D.F., 1960.

Apion godmani Wagn. is an important pest of *Phaseolus* beans grown in Mexico, the eggs being laid in the young pods and the larvae feeding on the seeds. Some varieties are less attacked than others, and experiments were begun in 1952 on the production of resistant varieties. Some highly resistant crosses were obtained.

Ramirez Genel (M.). **Infestación de campo por insectos de granos almacenados. Observaciones en maíz de la mesa central y del trópico en 1959.** [Field infestation by stored-grain insects. Observations on maize in the central-plateau and tropical region in 1959.]—*Agric. tec. Méx.* no. 10 pp. 32–35, 9 figs. Mexico, D.F., 1960.

Samples of maize ears were taken in various parts of the central plateau and tropical region of Mexico in 1959 and examined for infestation by insects that continue their development in the stored grain. Those found comprised *Prostephanus truncatus* (Horn), *Sitophilus oryzae* (L.), *Tribolium* sp., *Sitotroga cerealella* (Ol.) and *Cathartus* sp. Their local distribution and relative importance are discussed.

Quintana R. (R.), Wilbur (D. A.) & Young (W. R.). **Insectos del grano almacenado que infestan al maíz en el campo.** [Stored-grain insects that infest maize in the field.]—*Agric. tec. Méx.* no. 10 pp. 40–43, 4 figs. Mexico, D.F., 1960.

Observations in the north of the Mexico Valley in 1958–59 showed that stored maize ears were infested by several insects that initiated their attacks in the field. In order of decreasing importance these were *Prostephanus truncatus* (Horn), *Sitotroga cerealella* (Ol.), *Sitophilus oryzae* (L.), *Oryzaephilus surinamensis* (L.) and *Caulophilus latinasus* (Say). Even though the maize is dried in the sun, fumigation is necessary for control.

Young (W. R.), Jennings (P. R.) & Calixto Cruz (N.). **¿Existe en Mexico la hoja blanca del arroz?** [Is the hoja blanca disease of rice present in Mexico?]—*Agric. tec. Méx.* no. 10 pp. 59–60, 2 figs., 5 refs. Mexico, D.F., 1960.

The authors review the distribution of the hoja blanca disease of rice [*cf. R.A.E.*, A **47** 31] and state that it has recently been reported in Guatemala and El Salvador. The virus that causes it is transmitted by *Chloriona* (*Sogata*) *orizicola* (Muir) in rice and by *C.* (*S.*) *cubana* (Crawford) in certain wild grasses [*cf.* **43** 544]. Investigations were begun in the Veracruz area of Mexico in 1957, and *C. orizicola* was found on rice near Campo Cotaxtla in November 1958 and both *C. orizicola* and *C. cubana* on rice in the same area in July 1959. Symptoms of the disease were observed on *Echinochloa colonum* and *Digitaria* sp. growing in the rice-fields in early May 1960, but the rice itself was not affected. *E. colonum* was subsequently found to be infected in seven commercial fields, and a single infected rice plant was found near Piedras Negras. Collection of insects on rice and grasses showed the presence of *C. orizicola*, *C. cubana* and *C.* (*S.*) *furcifera* (Horv.) at both places; the last has not been recorded as a vector of the virus. Vector species were also found on rice and wild grasses near Jojutla, Morelos, in 1960, but no symptoms of the disease were observed.

Mariconi (F. A. M.) & Paiva Castro (U.). **Notas sôbre a saúva e o sauveiro.** [Notes on leaf-cutting ants and their nests.]—*Biológico* **26** no. 6 pp. 97–108, 4 figs., 16 refs. São Paulo, 1960.

Lists are given of the leaf-cutting ants (*Atta* spp.) that occur in Brazil and in the State of São Paulo, showing their distribution there, followed by notes on the castes, habits, nests and control.

Suplicy filho (N.) & Fadigas jr. (M.). **Contrôle do pulgão do algodoeiro com polvilhamento de parathion e metilparathion a 1%.** [Control of the cotton aphid with 1 per cent. dusts of parathion and methyl-parathion.] —*Biológico* **26** no. 6 pp. 109–110. São Paulo, 1960.

Tests in São Paulo showed that dusts containing 1 per cent. parathion or methyl-parathion gave very effective control of *Aphis gossypii* Glov. on cotton 3–6 days after application.

Kaschef (A. H.). *Lariophagus distinguendus* **Först. (Hymenoptera: Pteromalidae) ectoparasite on** *Rhizopertha dominica* **Fab. (Coleoptera: Bostrychidae).**—*Bull. Soc. ent. Egypte* **43** pp. 165–184, 12 figs., 28 refs. Cairo, 1959.

The following is based on the author's summary. *Rhyzopertha dominica* (F.) is an important pest of stored grain in many countries. In rearing experiments in Egypt at 26°C. [78·8°F.] and 70 per cent. relative humidity, development was completed in 75 days, the egg and pupal stages lasting 9 and 7·5 days, respectively. *Lariophagus distinguendus* (Först.) is easily reared in the laboratory as an ectoparasite of certain stored-product pests, and it was successfully bred on *Sitophilus* (*Calandra*) *granarius* (L.), *S.* (*C.*) *oryzae* (L.), *Ptinus tectus* Boield., *Stegobium paniceum* (L.) and *R. dominica*, the last originating from three different countries. Details of its bionomics and behaviour are described.

Shazli (A.) & Zazou (M. H.). **Control of onion thrips by surface and systemic insecticides.**—*Bull. Soc. ent. Egypte* **43** pp. 185–191, 1 fig., 7 refs. Cairo, 1959.

Tests were carried out in Alexandria in 1956 with emulsion sprays of aldrin, BHC, DDT, dieldrin, endrin, parathion (Fosferno), methyl-parathion (Metasystox), Thiodan (HOE 2671) and toxaphene for the control of *Thrips tabaci* Lind. on cotton and onion. All materials reduced the population on both crops in three days, and dieldrin and Thiodan gave the longest-lasting control. The prolonged effect of dieldrin reduced the seed yield of onions grown for seed by repelling and killing pollinating insects.

Phorate (Thimet) was tested as a seed treatment on onions in 1959 and gave protection from infestation for about a month. Soaking the seeds in a liquid preparation was better than a dry treatment.

Kamel (E.) & Shazli (A.). **Life-history and morphology of *Crocidosema plebeiana* Z., in Egypt (Lepidoptera: Tortricidae).**—*Bull. Soc. ent. Egypte* **43** pp. 193–201, 2 figs., 17 refs. Cairo, 1959.

As larvae of *Crocidosema plebeiana* Zell. were found commonly attacking the flowers and seed capsules of hollyhock (*Althaea rosea*) in Egypt and were at first mistaken for those of *Pectinophora* (*Platyedra*) *gossypiella* (Saund.), the authors describe all stages of this moth, pointing out the differences between the larvae of *C. plebeiana* and *P. gossypiella*, and record investigations on its bionomics. The egg, larval and pupal stages averaged 2·9, 17·6 and 7·8 days, respectively, the adults survived for 9·7 days, and the number of eggs per adult pair was 70–103. Larvae were common on hollyhock from May to August.

Abul-Nasr (S.). **Field tests on the use of a polyhedrosis virus disease for the control of the cotton leaf-worm, *Prodenia litura* F.**—*Bull. Soc. ent. Egypte* **43** pp. 231–243, 8 refs. Cairo, 1959.

The following is based on the author's summary. Four field tests were carried out near Giza and in the north of the Nile Delta on the value of the polyhedrosis virus of *Prodenia litura* (F.) for the control of the larvae on cotton, sweet potatoes and lucerne [*cf. R.A.E.*, A **48** 175]. Difficulty was experienced in rearing larvae in the laboratory for the production of virus material, and it is suggested that this should be obtained by treating a heavily infested field plot of clover during May, so that the material is available by the time cotton has to be treated. Excellent control of all instars was obtained in the tests, even with concentrations of virus material (the liquefied bodies of larvae killed by the virus) as low as 1 part in 500 parts water. The result on the crop depended on the date of application, but the real effect on the insect population could not be estimated, owing to reinfestation from the surrounding untreated area.

Shazli (A.) & Beshr (M. A.). **Persistence of Fosferno and Thimet toxicities in cotton seedlings and their effect on germination and growth of seedlings.**—*Bull. Soc. ent. Egypte* **43** pp. 319–326, 10 refs. Cairo, 1959.

Parathion (Fosferno) and phorate (Thimet) were tested as seed treatments for the protection of cotton from infestation by *Aphis gossypii* Glov. in Egypt.

Parathion was used as a liquid in which the seeds were soaked for 24 hours. It gave no protection at 0·01–0·02 per cent. concentration, very little at 0·03–0·05 per cent. and variable protection for 13 days at 0·1 per cent. The higher concentrations reduced germination. Phorate, similarly tested, gave better results, a concentration of 0·05 per cent. protecting for 23 days and having no depressing effect on germination.

Hassan (A. S.), El Nahal (A. K. M.) & El Badry (E. A.). **Infestation of cotton with spider mites (Acarina). Part I: The species of spider mites found on cotton plants in Egypt and their predators.**—*Bull. Soc. ent. Egypte* **43** pp. 357–365, 2 graphs, 15 refs. Cairo, 1959. **Part II: Changes of spider mites population on cotton seedlings after treatment with some synthetic organic insecticides.**—*T.c.* pp. 367–377, 2 graphs, 8 refs. **Part III: Changes of population of spider mites and their predators after the use of certain insecticides for the control of late-season cotton pests.**—*T.c.* pp. 379–389, 6 refs. **Part IV: The use of certain acaricides in combination with certain insecticides for the control of the red spider mites infesting cotton plants.**—*T.c.* pp. 391–400, 1 graph, 8 refs.

A survey of mites on cotton at four places in Egypt in 1956–57, recorded in the first part of this paper, showed that the species present were *Tetranychus cinnabarinus* (Boisd.), *Oligonychus coffeae* (Nietn.) (*terminalis* (Sayed)), *Eutetranychus banksi* (McG.), *Brevipalpus obovatus* Donn. and *Tarsonemus* sp., of which the first was the most important. Their seasonal prevalence and predators are reviewed.

The experiments described in the second part were designed to ascertain the effects on the mites of toxicant applied to cotton against early-season pests. Among the sprays tested, 0·1 per cent. methyl-parathion (Meta-systox) and 0·2 per cent. azinphos-methyl (Gusathion) caused considerable reductions in mite populations, but dieldrin, wettable BHC, toxaphene, DDT with γ BHC and Thiodan (HOE 2671) resulted in increases. Parathion, Chlorthion, nicotine sulphate, trichlorphon (Dipterex) and a BHC emulsion concentrate had no appreciable effect. Seed treatment with phorate (Thimet) or Disyston [O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate] was very effective against the mites for 6–8 weeks from the time of plant emergence.

Similar tests of treatments for the control of late-season pests are described in the third part. Sprays of toxaphene, dieldrin, and DDT with γ BHC resulted in severe mite infestations, associated with considerable reductions in predator populations, but azinphos-methyl caused no such increase.

The following is based on the authors' summary of the fourth part. Field experiments were carried out on the control of mites on cotton by the use of Meta-iso-systox [O,O-dimethyl S-2-(ethylthio)methyl phosphorothioate], thiometon (Ekatin), Delnav [2,3-p-dioxane S,S-bis(O,O-diethyl phosphorodithioate)] and Tedion in sprays of toxaphene, dieldrin or a mixture of DDT and γ BHC applied for late-season insect control. All the acaricides proved effective at the rates used against both the adult and immature mites, though there were variations between the different combinations. The first two were the most effective, whatever the insecticide with which they were combined. The duration of effectiveness varied, being about 30 days against the immature mites and about 30, 17–20, 15–17 and 17–20 days for the four acaricides, respectively, against the adults. All treatments increased the yield, Meta-iso-systox doing so the most. The reduction in yield on plots not treated with an acaricide ranged between 20 and 33 per cent.

Mohamed Al-Sayed Ayoub. **Studies on the distribution, behaviour, feeding habits and control of** *Microcerotermes diversus* **Silv. attacking live plants in Saudi Arabia (Isoptera: Metatermitidae).**—*Bull. Soc. ent. Egypte* **43** pp. 429–432. Cairo, 1959.

Microcerotermes diversus Silv. was found injuring living plants in Saudi Arabia in 1955, and a survey in 1955–58 showed it to be widely distributed and injurious to numerous fruit trees and other cultivated and wild plants. The damage caused to young nursery trees was severe. Some control was afforded by birds and ants and by watering and cultivating the soil. Numerous insecticide treatments were ineffective or too expensive, but DDT, BHC and aldrin gave control for at least three years when applied as emulsion concentrates or wettable powders to the irrigation water at rates affording 2 lb. aldrin or γ BHC or 9 lb. DDT per acre.

White (M. G.). **Occurrence of the house longhorn beetle,** *Hylotrupes bajulus* **L. (Col., Cerambycidae) in Jersey, C.I.**—*Ent. mon. Mag.* **94** no. 1134 p. 244. London, 1958.

Adults of *Hylotrupes bajulus* (L.) emerged from floorboards in a farmhouse in Jersey in August 1957, and evidence of other infestations was obtained there during the next three months. It appears that this Cerambycid, which was not previously known in the Channel Islands, was introduced during the war in timber from France, where it infests forests of maritime pine (*Pinus pinaster*) along the Atlantic seaboard.

Paramonov (A.). **A possible method of estimating larval numbers in tree crowns.**—*Ent. mon. Mag.* **95** no. 1139 pp. 82–83, 9 refs. London, 1959.

Since there is no accurate and reasonably easy method for the direct sampling of larvae in the crowns of trees [*cf. R.A.E.*, A **45** 177] and methods based on frass counts are not entirely satisfactory, the author describes one based on the collection of head capsules from moulting larvae that shows promise. In preliminary studies with larvae of *Bupalus piniarius* (L.) and *Tortrix viridana* (L.) in muslin sleeves, all the head capsules were recovered and could be separated from débris by flotation in water. In a field trial in 1958 in a stand of Corsican pine [*Pinus nigra laricio*] in eastern England in which population studies on *B. piniarius* were in progress, even the small first-instar head capsules were recovered from the material retained by metal funnels supported about 3 ft. above the ground, each with a collecting area of $\frac{1}{5}$ sq. yd. and a replaceable muslin bag at the narrow end. Preliminary tests indicated that losses due to retention of capsules in the canopy were not serious. The method is of particular value for estimating populations of *B. piniarius* in the early larval instars, which are difficult to detect on shoot samples.

Popov (G.). **Some notes on injurious Acrididae (Orthoptera) in the Sudan-Chad area.**—*Ent. mon. Mag.* **95** no. 1139 pp. 90–92, 4 refs. London, 1959.

Notes are given on several Acridids that were observed during a tour in the Sudan and the Chad Republic in July–October 1958 and in the Middle

Niger region of Mali (French Sudan) during the winter and spring of 1955–56 and were common enough to be of some economic importance. *Anacridium melanorhodon melanorhodon* (Wlk.) was widespread in the central and western Sudan and eastern Chad and most numerous in western and central Darfur (western Sudan). It occurred principally in wooded areas and on species of *Acacia*, *Balanites* and *Zizyphus*, and was seen only rarely on the ground. A thin band of hoppers was noted in the Sudan in July and several swarms of adults in Chad and the Sudan in October. This species damages native trees, of which some are of great economic importance, fruit trees and grain crops in the Sudan, where it appears to have increased in numbers during the past few years; control measures were organised against it in the last two. It is of less importance in the other areas.

Acridids were numerous in October in most cultivated millets, especially *Pennisetum typhoides*, in Chad and the Sudan and caused considerable damage in many areas. The species concerned varied, but the commonest in eastern Chad and Darfur were *Kraussaria angulifera* (Krauss), *Hieroglyphus daganensis* Krauss and *Cataloipus* sp., which were also common in woodlands away from cultivated areas. No bands or swarms were seen, but egg-pods of *K. angulifera* were found at a density of 80 per sq. yd. in Mali in April 1956. No control measures are applied, but all three species are collected for food and for sale.

A species of *Phymateus* was reported to have caused serious damage, particularly to mango trees, in gardens at a place in western Sudan in November and December 1957.

Greathead (D. J.). **On *Dirhinus excavatus* Dalman (Hym., Chalcididae) and an Aleocharine larva (Col., Staphylinidae), parasites of the pupae of *Stomorhina lunata* (F.) (Dipt., Calliphoridae) in Eritrea.**—*Ent. mon. Mag.* **95** no. 1140 pp. 105–108, 8 figs., 11 refs. London, 1959.

During work on *Stomorhina lunata* (F.), a predator of the eggs of *Schistocerca gregaria* (Forsk.) in Eritrea [*cf. R.A.E.*, *A* **47** 54], some of the field-collected puparia being reared to provide a stock failed to give rise to adults. Many of them were found to be parasitised by the Chalcidid, *Dirhinus excavatus* Dalm., and a few by an undetermined Staphylinid, probably of the genus *Aleochara*, of which no adults were obtained. Descriptions of the larvae of these two parasites are given, with observations on their bionomics. The complete development of *D. excavatus* lasted 2–7 weeks on the coast in winter, when average maximum and minimum air temperatures are between 90 and 70°F.; the percentage parasitism by this species did not exceed 10, except at one place, where it reached 32. The Staphylinid was found only at one place, where it attacked fewer than 3 per cent. of the puparia.

Hurlock (E. T.). **Recent occurrences of *Mussidia nigrivenella* Rag. (Lep., Phycitidae) on produce imported into Britain.**—*Ent. mon. Mag.* **95** no. 1141 p. 128, 1 pl., 5 refs. London, 1959.

During 1953–58, *Mussidia nigrivenella* Rag. was intercepted at ports in Britain four times on butter beans (*Phaseolus lunatus*) from Nigeria, eight times on Calabar beans (*Physostigma venenosum*) from Sierra Leone and once on cacao beans from Ghana.

Woodroffe (G. E.) & Halstead (D. G. H.). *Fulvius brevicornis* **Reut. (Hem., Miridae) and other insects breeding on stored Brazil nuts in Britain.**—*Ent. mon. Mag.* **95** no. 1141 pp. 130–133, 1 fig., 8 refs. London, 1959.

Notes are given on insects and mites collected from Brazil nuts that were imported into Britain from Manaus, Brazil, in June 1958, subjected to various treatments involving spraying with or immersion in water and stored until October in a rectangular stack, 10 × 7 × 4ft., in southern England in an experiment to determine optimum storage conditions so as to minimise damage by moulds. During storage, the nuts received a certain amount of treatment, such as spraying with water, and the temperature in the stack was usually between 16 and 22°C. [60·8 and 71·6°F.] with extremes of 15 and 24°C. [59 and 75·2°F.]. Insects and mites attacked only nuts with damaged shells, but moderate numbers are probably maintained in the débris. When the shells are damaged, the kernels are rapidly destroyed by mites; *Acotyledon* sp., *Caloglyphus rodionovi* Zkhv. and *Leiodinychus krameri* (Can.) became numerous in the nuts and, to a less extent, in the screenings. Of some 22 species of Coleoptera found, all except *Oligota parva* Kraatz were on the outside of the nuts or in the screenings and fed on moulds or were predacious; only *Carpophilus dimidiatus* (F.) and another closely related species are likely to attack the kernels. *O. parva*, which with *Somotrichus unifasciatus* (Dej.), is frequent in imported Brazil nuts, was common in damaged nuts in which mites were numerous. Many undetermined Dipterous larvae occurred in damaged nuts and screenings, and the only other insects found were an Anthocorid and the Mirid, *Fulvius brevicornis* Reut., a probable predator of which all stages occurred in considerable numbers.

Kerrich (G. J.) & Quinlan (J.). **Studies on Eucoiline Cynipoidea (Hym.).**—*Opusc. ent.* **25** no. 3 pp. 179–196, 30 figs., 16 refs. Lund, 1960.

The authors discuss the identity of certain species of *Eucoila*, point out in connection with studies of the parasites of *Oscinella frit* (L.) in Britain that the species formerly known as *Cothonaspis hexatoma* Htg. should be placed in the genus *Hexacola*, with which *Hexaplasta* is congeneric, and that since *Rhoptromeris* now has generic status, its type species, *R. eucera* (Htg.), should no longer be left in *Eucoila*, redescribe three species of *Trybliographa*, and describe *T. spaniandra*, sp. n., from numerous females and one male reared from puparia of *Hylemyia* (*Leptohylemyia*) *coarctata* (Fall.) in southern Britain.

Hughes (R. D.) & Salter (D. D.). **Natural mortality of** *Erioischia brassicae* **(Bouché) (Diptera, Anthomyiidae) during the immature stages of the first generation.**—*J. Anim. Ecol.* **28** no. 2 pp. 231–241, 1 graph, 23 refs. Oxford, 1959.

Hughes (R. D.). **The natural mortality of** *Erioischia brassicae* **(Bouché) (Diptera, Anthomyiidae) during the egg stage of the first generation.**—*T.c.* pp. 343–357, 4 figs., 3 refs.

These papers are the first of a proposed series dealing with investigations begun in central England in 1954 on the relative importance of various mortality factors in controlling populations of *Hylemyia* (*Erioischia*) *brassicae* (Bch.) on cruciferous crops. The first contains an account of preliminary

investigations on natural mortality in the immature stages of the first generation, mostly on cabbage, and includes descriptions of the methods used for estimating populations of the different stages and information on the bionomics of *H. brassicae*. Typical sampling data, mostly obtained in 1958, are shown in tables and are used to illustrate methods for estimating populations. From data obtained over a period of five years, it was found that mortality during development averaged over 95 per cent. and that major losses occurred between the egg and larval and between the pupal and adult stages. The possible causes of mortality in each stage are listed; mortality appeared highest in the egg stage.

The following is based partly on the author's summary and discussion of the second paper. The first-generation eggs were readily eaten by Carabids and Staphylinids in the laboratory, and eggs showing similar signs of attack were found in the field [*cf. R.A.E.*, A **46** 191]. When counts are made of the number of eggs laid, this destruction results in an underestimate of the total. A method is described of deriving the average survival of eggs over a short period by counting the eggs at different time intervals. Predation losses over the short periods are related to contemporary daily trap-catches of predators, and the relation is used to estimate the probability of egg survival on each day; this probability is used in conjunction with the number of eggs counted to estimate the total number laid. Calculations showed that predation is the major cause of egg mortality, and it accounted for over 90 per cent. of the losses in the first generation in 1957 and 1958; reduced viability may account for about a tenth of the difference between the total mortality that occurs between the egg and larval stages and egg mortality due to predation, and other contributory factors are the effect of drought on the newly hatched larvae and failure of the latter to find a food-plant. The efficiency of the predators is affected by weather, which influences their activity, determines the period during which eggs are available and, in the case of heavy rain, may protect the eggs by sealing the soil.

Dixon (A. F. G.). **An experimental study of the searching behaviour of the predatory Coccinellid beetle** *Adalia decempunctata* **(L.).**—*J. Anim. Ecol.* **28** no. 2 pp. 259–281, 7 graphs, 24 refs. Oxford, 1959.

The following is based on the author's summary of laboratory investigations on the searching behaviour of the predacious Coccinellid, *Adalia decempunctata* (L.). Searching larvae were negatively geotactic and positively phototactic and when on a leaf spent most time on the rim and veins. Well-fed larvae tended to search an area more thoroughly than starved ones, and starved first-instar larvae were more thorough than starved larvae of later instars. As the larvae increased in age, their efficiency in capturing the aphid, *Macrosiphum* (*Microlophium*) *evansi* (Theo.), increased; the efficiency of the adults lay between that of the second- and third-instar larvae. In each successive instar, the time taken to consume aphids of a particular instar decreased. The likelihood that a first-instar larva would catch a second aphid was greater than its likelihood of catching a first. The number of aphids that it was necessary to provide daily to ensure 50 per cent. survival of the larvae increased with each successive larval instar. With increasing aphid density, there was an increase in the rate of development and percentage survival of the larvae, until they showed signs of satiety when about 15 third-instar nymphs were provided each day. Larvae that consumed very few aphids each day traversed a greater area than those that received rather more. For 50 per cent. survival, first-instar larvae

required a prey density many times as great as that required by fourth-instar larvae. Adults were less active and laid more eggs when well fed. There was no linear relation between rate of increase of *A. decempunctata* and the number of aphids provided each day in the laboratory over the range of numbers tested. The searching ability and rate of increase of *A. decempunctata* are considered in relation to the assumptions of A. J. Nicholson [*R.A.E.*, A **21** 369] and V. Volterra, which appear to be oversimplified.

Watson (M. A.) & Mulligan (T.). **The manner of transmission of some barley yellow-dwarf viruses by different aphid species.**—*Ann. appl. Biol.* **48** no. 4 pp. 711–720, 23 refs. London, 1960.

The following is almost entirely the authors' summary. In experiments, four of seven strains of barley yellow-dwarf virus isolated from cereal crops in Great Britain [*cf. R.A.E.*, A **49** 383] were transmitted by *Rhopalosiphum padi* (L.) and three were not. *Macrosiphum* (*Sitobion*) *fragariae* (Wlk.), *M.* (*S.*) *avenae* (F.) and *M.* (*Metopolophium*) *dirhodum* (Wlk.) all transmitted viruses of both types, but they usually transmitted those of which *R. padi* was a vector less readily than did *R. padi* itself. The transmissibility of a virus by a given aphid species was not affected by transmission with another, less efficient, vector species. *Myzus* (*Neomyzus*) *circumflexus* (Buckt.) and *Aphis* (*R.*) *maidis* Fitch transmitted the few viruses with which they were tested. A few examples of *R. padi* acquired virus from infected leaves during a feeding period of 30 minutes and inoculated healthy seedlings during one of 15 minutes, but the minimum total time taken to acquire and transmit was ten hours, and 32 hours were needed by about half the aphids that transmitted. This may indicate the existence of a short latent period of the virus in the vector, although the evidence is not conclusive. The times spent on the infected plants influenced the results more than those spent on the healthy ones; many transmissions occurred with short feeding times on healthy plants so long as the time spent on infected leaves was long, but the reverse was not true. Nymphs of *R. padi* that moulted after they left infected plants on which they had fed long enough to become infective infected slightly fewer plants than adults fed for the same time.

Cadman (C. H.) & Chambers (J.). **Factors affecting the spread of aphid-borne viruses in potato in eastern Scotland. III. Effects of planting date, roguing and age of crop on the spread of potato leaf-roll and Y viruses.**—*Ann. appl. Biol.* **48** no. 4 pp. 729–738, 7 refs. London, 1960.

The following is virtually the authors' summary of this part of a series [*cf. R.A.E.*, A **48** 51]. Experiments in south-eastern Perthshire showed that the extent of spread of potato leaf-roll and Y viruses varied from year to year and that virus Y consistently spread more than leaf roll. Most spread of virus Y occurred before the end of June and of leaf-roll virus before the end of July. Both viruses spread slightly more in late- than in early-planted potato crops. When plants with leaf roll and already colonised by *Myzus persicae* (Sulz.) were placed in a healthy crop of Majestic potatoes at intervals during the season, the amount of virus spread decreased rapidly with increasing age of the crop. Spread of leaf roll occurred in all of 25 seed-potato crops in different districts of eastern Scotland in 1955, but in only 20 out of 36 similar crops in 1956. Annual and regional differences in virus spread appear to reflect differences in the time at which migrant aphids reach potato crops in early summer and the rate at which infestation builds up in the crops.

Wright (D. W.), Hughes (R. D.) & Worrall (J.). **The effect of certain predators on the numbers of cabbage root fly** (*Erioischia brassicae* (Bouché)) **and on the subsequent damage caused by the pest.**—*Ann. appl. Biol.* **48** no. 4 pp. 756–763, 1 pl., 4 figs., 6 refs. London, 1960.

The following is largely the authors' summary. To determine the importance of beetle predators on the natural control of *Hylemyia* (*Erioischia*) *brassicae* (Bch.) [*cf. R.A.E.*, A **49** 435], experiments were carried out in central England in 1958 and 1959 with various types of barriers to obtain different levels of beetle populations on cauliflower plots. *Bembidion lampros* (Hbst.) was the commonest predator present, but in June, when its numbers began to decrease, other species, such as *Trechus quadristriatus* (Schr.) and *Aleochara bipustulata* (L.), became of increasing importance. A barrier of DDT-treated straw placed in the soil round some plots decreased the numbers of beetles within them and allowed more eggs and larvae of *H. brassicae* to survive than on the untreated plots, so that crop damage was increased. Another type of barrier allowed the beetles to enter plots but made it difficult for them to leave. On these, fewer eggs and larvae of *H. brassicae* survived and the crop damage was much less than on the plots surrounded by straw barriers. Where the soil round the plants was treated with a dieldrin drench, the population of *H. brassicae* was reduced to a minimum and crop yields were considerably increased, but the insecticide caused a reduction in the numbers of predacious beetles.

Dunn (J. A.). **Varietal resistance of lettuce to attack by the lettuce root aphid,** *Pemphigus bursarius* **(L.).**—*Ann. appl. Biol.* **48** no. 4 pp. 764–770, 1 pl., 5 refs. London, 1960.

The following is based on the author's summary. Striking varietal differences in susceptibility to attack by *Pemphigus bursarius* (L.) were found among summer lettuces of 125 varieties and strains grown in central England in 1955. Subsequent work with 22 of them confirmed that three are highly and three markedly resistant. Immigrant alates of *P. bursarius* showed no preference for colonising any particular variety, and it seems that resistance to attack results from antibiosis [*cf. R.A.E.*, A **45** 352]. It is suggested that varietal differences in the composition of the root sap may account for the differences in susceptibility to *P. bursarius*, but analyses of water and alcohol extracts of root sap from resistant and susceptible varieties did not show consistent differences.

Gibbs (A. J.). **Studies on the importance of wild beet as a source of pathogens for the sugar-beet crop.**—*Ann. appl. Biol.* **48** no. 4 pp. 771–779, 3 figs., 24 refs. London, 1960.

The following is substantially the author's summary. The viruses of beet yellows and beet mosaic and the causal organisms of rust (*Uromyces betae*) and downy mildew (*Peronospora schachtii*) were found to be common in wild beet (*Beta vulgaris maritima*) growing on the foreshores of southern Wales and southern England in 1958–59. The viruses were more prevalent in south-eastern England than in the west, rust was more prevalent in the west than in the east, and downy mildew was equally prevalent in all regions. Beet yellows is commercially the most important disease and is commoner in sugar-beet crops in East Anglia than elsewhere in Britain. There was no evidence that it spread in East Anglia from wild beet to neighbouring

sugar-beet crops in the springs of 1958 or 1959, and *Myzus persicae* (Sulz.), its principal vector, was rarely found on wild beet growing on the foreshore. In glasshouse experiments, *M. persicae* colonised sugar-beet plants watered with tap water in preference to those watered with sea water. Daily watering with sea water made the plants unpalatable to the aphid within 14 days. Aphids also preferred leaves sprayed with distilled water to those that had been sprayed with sea water. Salt solutions gave results similar to those obtained with sea water [*cf. R.A.E.*, A **40** 142].

Walker (P. T.). **The relation between infestation by the stalk borer, *Busseola fusca*, and yield of maize in East Africa.**—*Ann. appl. Biol.* **48** no. 4 pp. 780–786, 3 graphs, 17 refs. London, 1960.

The following is based almost entirely on the author's summary. In this paper, the relation between maize yield and infestation by *Busseola fusca* (Fuller) in Tanganyika [*cf. R.A.E.*, A **48** 430] is expressed as a series of regression lines for crops of different potential yields. The reasons are given for assuming that the regression is rectilinear, and that the regression coefficient, or rate of fall in yield, is proportional to the maximum expected yield of the crop. For the crops examined, the formula for a general regression line of yield (y), as hundreds of pounds of dry grain per acre, on infestation (x), as the percentage of plants attacked transformed to angles, is $y = 45{\cdot}1 - 0{\cdot}55x$ for a high-yielding area and $y = 14{\cdot}55 - 0{\cdot}23x$ for a lower yielding one. This is equivalent to an increase in grain yield of 35 lb. per acre for every 1 per cent. decrease in infestation for the higher yielding group, and an increase of 17 lb. per 1 per cent. decrease for the lower. The applications of the relationship are discussed, in particular to studies of the economics of control by insecticides and the accuracy of methods of sampling infestations.

Willis (R. J.). **Experiments on the control of big bud of black currants.**—*Res. exp. Rec. Minist. Agric. N. Ire.* **8** pt. 1 pp. 1–8, 3 refs. [Belfast] 1959.

The following is based on the author's summary. Experiments designed to assess the value of various recently developed toxicants for the control of *Cecidophyes* (*Phytoptus*) *ribis* (Westw.) on black currant in Northern Ireland are described. The only one that proved more effective than the standard spray of oil emulsion was endrin, which gave good control at 0·04 per cent. Trials confirmed that its use would not impair fruit flavour or plant growth, but it cannot be recommended until more is known of the extent to which residues in the fruit might prove harmful [*cf. R.A.E.*, A **48** 503].

Willis (R. J.). **Chemical control of cabbage root fly attacks on cauliflower crops.**—*Res. exp. Rec. Minist. Agric. N. Ire.* **8** pt. 1 pp. 53–72, 10 refs. [Belfast] 1959.

The following is based on the author's summary. An account is given of experiments carried out in Northern Ireland in 1953–58 to examine the value of insecticides, applied as root dips, dust collars and liquid drenches, for the control of *Hylemyia* (*Erioischia*) *brassicae* (Bch.) on spring-planted cauliflowers. The effects were assessed of insecticidal treatment on crop yields and the rate of curd production under the weather conditions

experienced. The placing of a γ BHC or aldrin dust collar round each plant after transplanting resulted in high crop yields with negligible effects on the rate of curd production. The application of liquid insecticidal drenches to individual plants was similarly effective, but this type of treatment was not suitable for plants grown on ridges. Root dip treatment prior to transplanting was accompanied, though not invariably, by insecticide-induced checks to plant growth; the extent of these was related to the type and formulation of the insecticide and to the weather.

Preliminary experiments, involving the raising of transplants in soil incorporating insecticidal dusts, indicated that a dressing of 50 lb. γ BHC per acre did not adversely affect the growth of cauliflower seedlings and that transplants raised in such soils could, without further insecticidal treatment on transplanting, produce crop yields equivalent to those obtained following conventional root-fly control measures. The beneficial effects on subsequent cropping, following early growth in γ BHC-treated soil, were shown to be independent of the physical transference of soil containing insecticide at transplanting. The incorporation in the seed-bed of liquid formulations of γ BHC at a dosage rate comparable with that of the effective dust formulations resulted in marked phytotoxic effects on the developing seedlings.

Sømme (L.). *Ephestia cautella* (**Wlkr.**) (**Lep., Pyralidae**), **new to Norway.**—*Norsk. ent. Tidsskr.* **11** pt. 1–2 pp. 20–21, 1 fig. Oslo, 1959.

A survey of stored-products pests in Norway in the summer of 1958 showed the presence of *Cadra* (*Ephestia*) *cautella* (Wlk.), which had not previously been recorded from that country. It appeared to be more important than *Ephestia elutella* (Hb.) in chocolate factories, in which it was reared from cacao beans, almonds, groundnuts and hazel-nuts [*Corylus avellana*]. One adult and two larvae were found in Oslo harbour on almonds imported from Italy, and two adults on imported maize of unknown origin.

Joly (R.). **Adaptation alimentaire de** *Lymantria dispar* **L. et décalage des générations dans l'année. (Travaux préliminaires pour mise au point de la lutte biologique.**)—*Rev. for. franç.* **11** no. 11 pp. 769–774, 1 ref. Nancy, 1959.

Lymantria dispar (L.) is an important defoliator of oaks in southern France. It has several natural enemies and diseases, but use of these for biological control depends on the establishment of a laboratory colony of the insect capable of providing larvae at all times of the year. Conifers have been stated to be unsuitable as food-plants for *L. dispar*, but they are infested in the field, and pine (*Pinus sylvestris*) appeared suitable as a winter food-plant for the larvae in the laboratory.

Joly (R.). **Influence des défoliateurs forestiers sur l'accroissement.**—*Rev. for. franç.* **11** no. 11 pp. 775–784, 1 ref. Nancy, 1959.

Since little is known of the extent to which defoliation by insect pests is reflected in the loss of increment by forest trees, the author carried out a small-scale experiment on the effects of partial or complete defoliation of poplar trees in two successive years, simulating that caused by an outbreak of Lepidopterous larvae. The results are described in detail and indicated that complete defoliation resulted in 50 per cent. loss of growth.

Hans (H.). **Beiträge zur Biologie von** *Sitona lineatus* **L.** [Contributions to the bionomics of *S. lineatus*.]—*Z. angew. Ent.* **44** pt. 4 pp. 343–386, 17 graphs, 50 refs. Hamburg, 1959. (With a summary in English.)

Sitona lineatus (L.) causes serious damage to young peas and broad beans [*Vicia faba*] in spring in some years, and an account is given of field and laboratory investigations on various aspects of its bionomics and its changes in population on these and other leguminous crops in and near Göttingen in 1953–55. The following is based partly on the author's summary of the results.

Young adults appeared to prefer a temperature of 22°C. [71·6°F.], but one of 12°C. [53·6°F.] was preferred after oviposition had begun. Adults of all ages in general reacted positively to horizontally directed light, but there appeared to be no preference for light of a particular intensity. Starved adults sought a humid environment, and fed ones a dry environment. Flight occurred in the field at temperatures above about 18°C. [64·4°F.], provided that light intensity was above a certain limit and wind speeds were low, but higher temperatures to some extent counteracted other limiting factors. Temperatures of 32–35°C. [89·6–95°F.] induced flight in the laboratory. No evidence was found of any ability to distinguish colours or to determine the presence of plants by smell. Peas were preferred for feeding to broad beans or vetch [*Vicia*], and these to lucerne, red clover [*Trifolium pratense*] or runner beans (*Phaseolus vulgaris*) [*cf. R.A.E.*, A **19** 588], which were hardly fed on at all. The first three were also greatly preferred for oviposition, and population increase was most rapid on vetch. Migration to pea was completed by 10th May in 1954, but not until the end of May in 1955, and was evidently accomplished by flight. The overwintered adults survived on pea until the end of June in 1954 and the end of July in 1955, the soil-inhabiting larvae of the new generation appeared in late June or early July in all three years, and the young adults left the plants from about the middle or end of July. Pairing was observed in a bean field in October in 1954, but usually occurred after overwintering. When adults were brought to the laboratory in autumn or early winter and kept in artificial light for 16 hours a day, only those fed on peas or beans oviposited in the same year. The development of a second generation in the field is evidently prevented by low temperatures. Migration to winter quarters was apparently accomplished either by crawling or by flying, and the adults overwintered preponderantly in fields of lucerne or clover. These were mostly near pea fields in 1954, but were evenly distributed to at least a mile from them in 1955. No larvae overwintered. *Perilitus* sp. and *Leiophron* sp. were reared from up to 34 per cent. of the weevils collected in July 1954, and a fungus, *Beauveria* sp., also caused considerable mortality, especially in dense populations of *S. lineatus*. Damp weather favouring fungus attack in late summer, damp conditions in winter and weather unfavourable to flight in spring are considered to be the main factors limiting the population.

Faber (W.). **Die neue Karte der Maikäferflugjahre in Österreich—Grundlage für eine zuverlässige Engerlingsprognose.** [The new map of *Melolontha* flight years in Austria—a basis for a reliable forecast of larvae.]—*Pflanzenarzt* **14** no. 5 pp. 41–42, 1 col. fldg. map. Vienna, 1961.

A coloured map is given showing for the period 1960–71 the years and districts in Austria in which adults of strains of *Melolontha* with three- and

four-year life-cycles are likely to emerge. *M. melolontha* (L.) and *M. hippocastani* F. are not differentiated, since the areas in which they are important overlap only to an insignificant degree. The occurrence of larvae can be forecast from the data shown.

Russ (K.). **Lohnt sich eine Bekämpfung der Kirschfruchtfliege?** [Is control of the cherry fruit-fly worth while?]—*Pflanzenarzt* **14** no. 5 p. 45. Vienna, 1961.

In a test in Austria in 1959, preparations containing 50 per cent. parathion or DDT were tested at 0·03 and 0·2 per cent., with a wetting agent, for the control of *Rhagoletis cerasi* (L.) on cherry. Two applications of the parathion spray, on 29th May and 5th June, afforded complete protection from attack, whereas two of DDT gave only 87 per cent. reduction. Parathion apparently killed larvae already in the fruits, whereas DDT did not.

Koula (V.) & Veselá (O.). **Stanovení přímé a reziduální toxicity aerosolů s obsahem některých dalších chlorovaných a fosforových insecticidů s kontaktním a systemickým účinkem pro mandelinku bramborovou (*Leptinotarsa decemlineata* Say) v laboratorních podmínkách.** [Determination of the direct and residual toxicity of aerosols containing some further chlorinated and phosphorus insecticides with contact and systemic effect on the Colorado beetle (*L. decemlineata*) in laboratory conditions.]—*Sborn. čsl. Akad. zeměd. Věd* Rostl. Výroba **6** (**33**) pt. 2 pp. 145–162, 10 figs., 11 refs. Prague, 1960. (With summaries in Russian, German & English.)

Laboratory tests in Czechoslovakia, in which 10 per cent. DDT aerosols were applied from an atomiser to *Leptinotarsa decemlineata* (Say) in a spray tower, showed that contact for at least six hours with the treated surface was necessary for complete kill of adults; 7·5 and 5 per cent. DDT aerosols were ineffective against both adults and fourth-instar larvae, but aerosols containing 1–2 per cent. γ BHC or 1·5 per cent. γ BHC with 2·5 per cent. DDT gave almost complete mortality of both stages. There was no ovicidal effect; simulated rain reduced the effectiveness of DDT, but not that of γ BHC. In tests of other insecticides in aerosols applied in the field in portable spray towers, methoxy-DDT and Thiodan both gave complete kill of fourth-instar larvae, heptachlor and dieldrin were fairly effective, chlordane and Potasan gave poor results, and various other phosphorus compounds, including systemic insecticides, and Isolan were useless.

Samšiňáková (A.) & Čermáková (A.). **Vliv infekce houby *Beauveria bassiana* (Bals.–Criv.) Vuill. na larvy mandelinky bramborové *Leptinotarsa decemlineata* Say.** [The effect of infection of the larvae of Colorado beetle, *L. decemlineata*, by the fungus, *B. bassiana*.]—*Sborn. čsl. Akad. zeměd. Věd* Rostl. Výroba **6** (**33**) pt. 2 pp. 163–168, 1 graph, 7 refs. Prague, 1960. (With summaries in Russian, German & English.)

Tests in Czechoslovakia showed that dusting with the pure spores was the best method of infesting larvae of *Leptinotarsa decemlineata* (Say) with *Beauveria bassiana*. The symptoms caused by the fungus and the course of the disease are described.

Kazda (V.). **Příspěvek k poznání života krytonosce zelného** (*Ceuthorrhynchus pleurostigma* **Marsh.**) **v Československu.** [Contribution to knowledge of the life of the cabbage weevil (*C. pleurostigma*) in Czechoslovakia.]—*Sborn. čsl. Akad. zeměd. Věd* Rostl. Výroba **6** (**33**) pt. 2 pp. 261–270, 21 refs. Prague, 1960. (With summaries in Russian & German.)

Investigations in 1949–58 in different climatic areas in western Czechoslovakia showed that *Ceutorhynchus pleurostigma* (Marsham) apparently had only one generation a year but occurred as two biological races. In the central, warmer and drier districts, one of these developed on charlock (*Sinapis arvensis*) in spring and apparently resembled the spring race recorded by Isaac [*R.A.E.*, A **11** 461], and the other developed on winter rape in autumn and was very variable in numbers [*cf.* also **46** 293]. In the colder, damper districts in the south of the country, both races attacked wild and cultivated crucifers but winter rape was very little infested.

Kazda (V.). **Příspěvek k poznání diapausy krytonosců, škodících na kulturních rostlinách brukvovitých:** *Ceuthorrhynchus napi* **Gyll.,** *Ceuthorrhynchus quadridens* **Panz. a** *Ceuthorrhynchus pleurostigma* **Marsh.** [Contribution to knowledge of the diapause of the weevils, *C. napi*, *C. quadridens* and *C. pleurostigma*, injuring cruciferous crops.]—*Acta Soc. ent. Čsl.* **55** no. 2 pp. 142–149, 15 refs. Prague, 1958. (With a summary in German.)

Laboratory and field observations were made in Czechoslovakia in 1949–53 on the diapause and overwintering of *Ceutorhynchus napi* Gylh., which infests winter rape, *C. quadridens* (Panz.), which infests rape and cabbage, and *C. pleurostigma* (Marsham), of which the spring race infests mainly charlock (*Sinapis arvensis*) and the autumn race attacks various crucifers [*cf.* preceding abstract]. It was found that the adults of the first two species entered diapause in the late summer but that it was not certain whether this lasted throughout the winter, though the beetles remained in the soil in a state of quiescence. The adults of the spring race of *C. pleurostigma* behaved similarly. Overwintering larvae of the autumn race were inactive, but there was no true diapause.

Skuhravá (M.). **Morfologie a bionomie bejlomorky ostružiníkové** *Lasioptera rubi* (**Schrank**) (**Dipt., Itonididae**). [Morphology and bionomics of *L. rubi*.]—*Acta Soc. ent. Čsl.* **55** no. 2 pp. 160–173, 11 figs., 2 graphs, 28 refs. Prague, 1958. (With a summary in German.)

The author describes all stages but the egg of *Lasioptera rubi* Heeg. and records field and laboratory investigations on its bionomics and natural enemies in Czechoslovakia in 1955–57. The Cecidomyiid causes galls on the stems of blackberry and other species of *Rubus*, both wild and cultivated. Oviposition occurred in June and July, the eggs being laid at the base of the buds on young shoots. The larvae burrowed into the rind and fed, causing the formation of galls, which appeared 6–7 days after oviposition. There were up to 51 larvae in a single gall, with an average of 13. The number of galls per shoot was usually 1–2 but sometimes as many as 5–7. Pupation took place in the galls from April to July, and the pupal stage lasted 10–15 days. In the laboratory, emergence occurred when the mean daily temperature reached 11·5°C. [52·7°F.] and was interrupted if the

temperature fell below this. In the field, emergence occurred from 13th May to 31st July, 4th May to 30th August and 11th May to 15th July in the three years, respectively. When galls were taken to the laboratory in January and kept at 25°C. [77°F.], the adults emerged in February–March.

The parasites reared from *L. rubi* included *Torymus macropterus* (Wlk.), *Eupelmella vesicularis* (Retz.), *Misocyclops ruborum* Kieff., *M. subterraneus* Kieff., *Eudecatoma submutica* (Thoms.), *Dasytes plumbeus* Müll. and two species of the genus *Tetrastichus*, of which the last five had not previously been recorded from it.

SÁRINGER (G.). **Untersuchungen über die Ökologie des Senfkäfers** (*Colaphellus sophiae* **Schall.**). [Investigations on the ecology of *C. sophiae*.] —*Acta biol.* **11** fasc. 2 pp. 109–143, 19 figs., 22 refs. Budapest, 1960. (With summaries in English & Russian.)

Colaphellus sophiae (Schall.) caused serious defoliation of white mustard (*Sinapis alba*) in 1956–58 in Hungary, where it had not previously been regarded as a pest, and the results are given of field and laboratory investigations on its bionomics carried out in 1957–59. The development of the egg and larva is described, and the food-plants of the Chrysomelid are reviewed from the literature. The following is based partly on the author's summary. The adults overwintered in the soil, where some remained for two winters or more. They were present on the plants, feeding on the leaves and buds, from as early as March until mid-July, and numbers were generally greatest in the last ten days of May. Rape and radish, as well as various wild plants, were also infested, but adults fed on these in the laboratory laid fewer eggs than those fed on mustard (which laid a maximum of 646 each), and the larvae attained their maximum size on mustard, which they preferred to the other plants. Pairing began 1–1½ weeks after emergence from hibernation, and a similar period elapsed before oviposition. Eggs were laid between lumps of soil. In the laboratory, the duration of the egg stage ranged from an average of 14 days at 16°C. [60·8°F.] to 7·5 days at 27°C. [80·6°F.] and that of the combined larval and pupal stages 34·4–35·8 days at a temperature varying from 17·8 to 25°C. [64·04–77°F.], irrespective of the food-plant. Larvae were present on the plants from mid-May and left them when fully fed, pupating in the soil from the end of May. There was only one generation a year. Some adults came to the surface in September and fed for a short time, but always returned to overwinter.

[ARNOL'DI (L. V.). Ed.] **Insects harmful to maize in the USSR. A guide.** [*In Russian.*]—9 × 5¾ in., 228 pp., 16 figs., refs. Moscow, Akad. Nauk SSSR, Zool. Inst., 1960. Price 9 *rub.*

This book, to which various authors have contributed, consists of an introduction in which the insect pests that attack maize in the field in the various parts of the Soviet Union, including regions of recent cultivation, are reviewed, a key for their identification from the damage caused is given and general protective measures are outlined, followed by systematic sections each dealing with insects of a particular order that infest the growing crop or the stored grain in the Soviet Union, or in neighbouring territories from which they might be introduced, with information on their synonymy, distribution and habits, and lists of selected references. An index to the scientific names is included.

Kalshoven (L. G. E.). **Observations on the nests of initial colonies of** *Neotermes tectonae* **Damm. in teak trees.**—*Insectes sociaux* **6** no. 3 pp. 231–242, 12 figs., 4 refs. Paris, 1959. (With a summary in French.)

This is an account of observations in Java showing that colonies of *Neotermes tectonae* (Damm.) living in the trunks of teak trees are initiated in dead branches in the crowns [*cf. R.A.E.*, A **46** 319, etc.].

Papers noticed by Title only.

Finney (G. L.). **A ventilation unit for aerating insectary sleeve cages.**—*J. econ. Ent.* **53** no. 5 pp. 959–960, 1 fig., 1 ref. Menasha, Wis., 1960.

Nicholls (C. F.). **A roll-up** [collapsible] **field cage for insects.**—*Canad. Ent.* **92** no. 3 pp. 177–178, 2 figs. Ottawa, 1960.

McDonald (S.) & Hall (N. W.). **A simple freeze-drying apparatus for preserving plant materials treated with insecticides.**—*Canad. Ent.* **92** no. 3 pp. 182–183, 1 fig. Ottawa, 1960.

Richards (W. R.). **A new species of** *Monellia* **Oestlund** [*M. microsetosa*, sp. n., from hickory in Canada and hickory and walnut in the United States], **with a synopsis of the aphids attacking hickory and walnut in Canada.**—*Canad. Ent.* **92** no. 3 pp. 221–230, 18 figs., 21 refs. Ottawa, 1960.

Utida (S.). **On fluctuations in population density of the rice stem borer** *Chilo suppressalis* [in Japan].—*Ecology* **39** no. 4 pp. 587–599, 11 graphs, 24 refs. Brooklyn, N.Y., 1958.

Knight (F. B.). **Measurement of** [adult] **Engelmann spruce beetle populations** [*Dendroctonus engelmanni* Hopk. on *Picea engelmanni* in the western United States].—*Ecology* **41** no. 2 pp. 249–252, 3 graphs, 7 refs. Brooklyn, N.Y., 1960.

Grison (P.), Vago (C.) & Maury (R.). **La lutte contre la processionnaire du pin** *Thaumetopoea pityocampa* **Schiff. dans le massif du Ventoux. Essai d'utilisation pratique d'un virus spécifique.**—*Rev. for. franç.* **11** no. 5 pp. 353–370, 6 figs., 7 refs. Nancy, 1959. [For shorter account see *R.A.E.*, A **49** 147].

Tambs-Lyche (H.). **A new species of** *Schizaphis* **Börner** [*Toxoptera* (*S.*) *borealis*, sp. n.] (**Hom., Aphid.**) **attacking** *Phleum pratense* **in Norway.**—*Norsk ent. Tidsskr.* **11** pt. 1–2 pp. 88–93, 9 figs., 8 refs. Oslo, 1959.

Jeffree (E. P.). **The world distribution of acarine disease** [*Acarapis woodi* (Rennie)] **of honeybees and its probable dependence on meteorological factors.**—*Bee World* **40** no. 1 pp. 4–15, 2 maps, 71 refs. London, 1959.

Hodek (I.). **Vliv teploty, vlhkosti a světla na ontogenetický vývoj slunéčka sedmitečného** (*Coccinella septempunctata* **L.).** [Effect of temperature, humidity and light on the ontogenetic development of *C. septempunctata*.]—*Acta Soc. ent. Csl.* **55** no. 2 pp. 121–141, 15 graphs, 37 refs. Prague, 1958. (With a summary in English.)

Leheta (M. F.). **Some observations on the** [daily] **behaviour of the Egyptian locust,** *Anacridium aegyptium* **L. (Orthoptera: Acrididae).**—*Bull. Soc. ent. Egypte* **43** pp. 155–163. Cairo, 1959.

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